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# USSR Report

MACHINE TOOLS AND METALWORKING EQUIPMENT



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23 November 1984

# USSR REPORT

## MACHINE TOOLS AND METALWORKING EQUIPMENT

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## INDUSTRY PLANNING AND ECONOMICS

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### TOP INDUSTRY MINISTER ON AUTOMATION TECHNOLOGY

Moscow KUZNECHNO-SHTAMPOVOCHNOYE PROIZVODSTVO in Russian No 5, May 84 pp 3-8

[Article by B. V. Bal'mont, USSR Minister of Machine Tool Building and Tool Industry: "Develop Production of Automated Equipment"]

[Text] With great political and labor enthusiasm, the Soviet people received First of May -- the day of international solidarity of workers in the struggle against imperialism, for peace, democracy and socialism. Undeviatingly, according to the peace program adopted by the 26th party congress, the CPSU and the Soviet state follow Lenin's foreign policy directed toward the preservation of peace in the entire world and to the maintenance of the just struggle of peoples for freedom, independence and social progress.

The fighting programs for action for the Soviet people at the modern stage are the Resolutions of the November (1982), June and December (1983) and February (1984) Plenums of the CPSU Central Committee.

Comrade Konstantin Ustinovich Chernenko, General Secretary of CPSU Central Committee, in his speech at the Special February (1984) Plenum of the CPSU Central Committee and in meeting the electors of the Kuybyshev Election District of Moscow, gave an in depth analysis of the key problems in domestic life and the international situation, and defined key directions in which the efforts of the Soviet people must be concentrated. At the February Plenum of the CPSU Central Committee, he stressed: "As far as the basic directions of our economic development are concerned, they were defined clearly by the party. Intensification, accelerated introduction in production of achievements of science and technology, implementation of large comprehensive programs, all this, in the final analysis, must raise to a qualitatively new level the production forces of our society."

Due to the large organizational and political work of the party, and the intensive work of the Soviet people in 1983, a further increase was achieved in the USSR national economy, general economic indicators increased, and their absolute increases as compared to the first two years of the five-year plan period were also higher.

The welfare of the Soviet people improved. The volume of industrial production increased by 4 percent as compared to 1982 and the productivity of labor in industry increased by 3.5 percent. Basic sectors of industry moved forward.

Efficiency of production increased. The labor of 3.5 million people was saved due to higher productivity; raw and other materials, fuel, power to an amount of about 2 billion rubles were saved. In 1983, agricultural products to an amount of 134 billion rubles were produced with an annual increase of 6.4 billion rubles. The transformation of the RSFSR non-virgin soil zone is continuing. The implementation of Provision Program is becoming the job of the entire nation.

Some 146 billion rubles of fixed capital were invested which is 6 billion rubles more than in 1982. Everything the party does is in the name of the people and for the people, to raise the material and spiritual standards of the lives of the Soviet people. The average monthly wage of workers and employees in the national economy was 182 rubles as compared to 177.3 rubles in 1982, while kolkhoz labor wages increased from 129 to 138 rubles. The social fund spent 134.5 billion rubles or 5.9 billions more than in 1982. More than 10 million persons were able to move to new housing and the costs of housing and municipal services did not exceed, on the average, 3 percent of the budget of worker and employee families.

In three years of the current five-year plan period, the machinebuilding sectors, including the machine tool and tool industry, developed at higher rates, according to resolutions of the 26th party congress, than the industry as a whole.

In implementing the decisions of the November (1982) and June (1983) Plenums of the CPSU Central Committee, worker collectives of the machine tool and tool industry fulfilled the plan tasks for 1983 for all the most important technical economic indicators. The state plan for volume indicators was overfulfilled for the ministry as a whole. The volume of production was increased by 6 percent and labor productivity by 7 percent as compared to 1982. Commercial output in the amount of 86 million rubles was greater than the plan, including forge-press machines which were greater by 12.5 million rubles.

Modern equipment and tools are being developed at an accelerated rate. Thus, the output of automatic machine tool lines increased in 1983 by 15.9 percent, automatic forge-press lines by 18 percent and NC machine tools by 10 percent.

It should be noted that the scale of renovating products is being expanded. Thus, in the three years of the five-year plan period, 830 outdated design products were removed from production and 1800 new series were mastered.

One important result in these three years was the expansion of the scale of the delivery of equipment and tools to sectors of the national economy, especially to machinebuilding, which facilitated the increase in the productivity of labor and the efficiency of production. Plants of our sector during these three years furnished the national economy with metalworking equipment in an amount greater than 7 billion rubles, including forge-press equipment for 1.6 billion rubles.

Along with positive results in the operation of our sector, including in forge-press machinebuilding, there were serious shortcomings in utilizing production capacities, expanding material and labor resources and management organization.

The situation remains unsatisfactory in capital construction and the plan of placing fixed capital and production capacities in operation has not been implemented.

Based on the decisions of the December (1983) Plenum of the CPSU Central Committee and the directions contained in the speech by Comrade Konstantin Ustinovich Chernenko, at the February (1984) Plenum of the CPSU Central Committee, all collectives of our sector, the VPO [All-Union Production Association] and the ministry must actively and persistently implement measures on introducing exemplary order in production; strengthen state, planning and labor discipline further; use advanced forms and methods of labor organization more widely; and increase the efficiency of competition. Available production and scientific-technological potential should be more fully utilized; the equipment shift coefficient should be increased; economy and thrift in using material, labor and financial resources should be strictly observed.

The following main direction of Comrade K. U. Chernenko, given in his speech to the electors of the Moscow Kuybyshev Election District, applies directly to our sector: "We should provide absolutely rapid and continuous renovation of all sectors in the national economy on the basis of the modern achievements of science and technology. This is one of our basic problems. Without this progress in society is unthinkable." It will be necessary to solve, on a wider scale, problems on supplying machinebuilding with progressive metal-working equipment.

Forge-press machinebuilding -- one of the leading subsectors of the machine tool and tool industry made a considerable contribution to the development of machinebuilding. At present, forge-press equipment processes over 34 million tons of rolled stock, 1.94 million tons of castings and 0.77 million tons of plastics in the national economy.

In the current five-year plan period, the main direction in developing forge-press machinebuilding and raising its technical standard is to provide for an accelerated output of modern automatic equipment and equipment to produce intermediate products by using a low-waste technology.

In recent years, considerable advances have been made in the design of the manufactured forge-press equipment. Thus, the share of universal forge-press machines equipped with automation and mechanization devices, including automatic complexes which provide maximum productivity of labor and free forge workers in intermediate product production, increased from 12.2 percent in 1980 to 26.2 percent in 1983.

The share of the following machines for metal saving processes also increased: hot-stamping crankshaft presses, stamping presses and equipment for producing articles of metal powders.

In the three years of the five-year plan period, plants of the subsector produced 6640 forge-press automatic machines, 679 NC machines, 195 automatic line sets and 1300 industrial robots.

It should be noted that a considerable amount of work was done by the associations, enterprises and scientific-technological organizations in developing and mastering equipment with high technical-economic parameters.

In the first three years of the 11th Five-Year Plan period, plants and production associations mastered 255 prototypes and adjusting series of new, progressive forge-press equipment and removed 90 models of outdated machines from production.

The renovation of manufactured equipment will make it possible to increase the number of models with the state emblem of quality. The ratio of the highest quality category of output in the total volume of commercial products reached 47.2 percent in 1983 as compared to 42.3 percent in 1980 and 7.3 percent in 1975.

A comprehensive solution of technical problems is characteristic for automated forge-press equipment being created.

Automatic complexes of hot-stamping and forging equipment were mastered including forging multi-impression rolls with manipulators, and complexes with forging steam-air hammers with manipulators.

A series of heavy and special machines was mastered, distinguished by progressive technical decisions and higher productivity and reliability. They are a 10-mega newton four-crank enclosed press, simple action with continuous regulation of the number of strokes; 10 and 16 meganewton single crank simple action press; a 10-meganewton two-crank simple action press; and a 8 meganewton four-crank simple action press with hydraulic protection and an extendable platform.

The considerable work of scientific and technological organizations on developing highly efficient automatic machines and complexes should be noted.

Since the start of the current five-year plan period, the ENIK mash [Experimental Scientific Research Institute of Forge-Press Machinebuilding] introduced 176 developments, whose use in the national economy saved 81 million rubles and over 48,700 tons of metal.

Thus, the "Burevestnik" model PB2632 1600 kilonewton, high speed hydraulic multiplunger press for stamping complicated shape forgings, raised the metal utilization coefficient to 40 percent, the productivity of labor 1.3-fold, and reduced electrical power consumption by 40 percent. Its use will save 260,000 rubles per year.

The institute developed and introduced a system of technological robotized complexes-modules (RTK) for sheet stamping using two and three-arm robots and 630 to 1600 kilonewton single-crank open presses.

The use of RTK makes it possible to implement the principle of modular design of flexible production systems of the second automation level (multioperational readjustable automatic lines) for sheet stamping production facilities.

The Moscow NPO [Scientific Production Association] of Forge-Press Machine-building did a great deal of work on developing and improving metal product equipment and automatic lines.

The Voronezh SKB [Special Design Bureau] of Forge-Press Machines and Automatic Lines developed new models of automatic machines for powder metallurgy, sheet stamping and automated complexes for sheet and volumetric stamping.

The Azov SKB of Forge-Press Machines and Automatic Lines developed automatic complexes using mass production forge-press machines -- single-crank open presses, sheet shears, sheet-bending rolls, combination press-shears and other machines.

The PKTikuzrobot developed various models of robotized complexes.

The Odessa "Pressmash" PO [Production Association] imeni 60-letiya oktyabrya had an entire series of interesting machines, important to the national economy, designed by its GKB [Head Design Bureau] .

New models of heavy and special design machines were developed by designers of the KB [Design Bureau] of the Voronezh PO for manufacturing heavy mechanical presses; the KB of the Dnepropetrovsk PO for manufacturing heavy presses; and the KB of the Ryazan' "Tyazhpressmash" PO.

A broad product list of automated complexes was developed by the following design bureaus: the Voronezh PO for Manufacturing KPO [Forge-Press Equipment] imeni M. I. Kalining and the Barnaul Mechanical Press Plant.

Production plans for 1984 and the following years show a positive trend in improving the structure of the KPO output which emphasizes its most progressive groups -- automatic equipment and equipment for making intermediate products by metal-saving processes.

The output forge-press machines is being maintained on the level of last year. At the same time, the output of progressive equipment groups is increasing at accelerated rates -- NC machines 1.9-fold and automatic lines 1.2-fold.

The ratio of automatic equipment in the total KPO output will be 39 percent, including machines equipped with automation and mechanization devices, will be 27.5 percent. The output of equipment for making intermediate products using a metal-saving technology will increase considerably. This will include crank hot-stamping presses and cold extrusion presses. Production of equipment for making products from metal powders will increase 2.2-fold.

New models of NC forge-press machines are being assimilated.

New models of robotized complexes are being developed, section and automatic lines using single-crank open presses, stamping, helical and hot-stamping presses.

It is planned to master a prototype series of a new model of forge-press processing centers -- an automated complex using one 630 kilonewton single-crank open press with an automatic change of dies, for processing intermediate strip products. The complex is equipped with an intermediate strip product magazine with means to load and unload packets. This processing center is, essentially, the prototype of a flexible production module for sheet-stamping production.

The ENIKmash together with associations and enterprises of the "Soyuzkuzmash" VPO will develop "processing center" types of flexible automatic production facilities for sheet stamping using a 400 kilonewton NC turret press. The use of such facilities in the national economy will increase labor productivity 8 to 10-fold and reduce metal consumption by 10 to 15 percent due to its efficient layout. The expected annual saving is about 1,200,000 rubles.

The manufacture of a 125 meganewton hot-stamping press is among the most important problems of 1984. The press will be used in an automatic line to stamp crankshafts and front axle beams of automobiles.

The following equipment was created by the Voronezh PO for Manufacturing Heavy Presses: a 63-meganewton four-crank press for manufacturing spars and 40-meganewton crank shears are being assimilated this year; new automatic 40-meganewton hot-stamping presses; a 25-meganewton hydraulic platen press to produce wood-chip plates from large oriented chips with a capacity of 6000m<sup>3</sup> and other machines.

There are a number of unutilized possibilities in developing and introducing new equipment and expanding the scale of output of progressive equipment in forge-press machinebuilding. There are shortcomings in the work of associations, enterprises and organizations of the sector to which attention was drawn in the decree by the CPSU Central Committee and the USSR Council of Ministers "On measures for accelerating scientific-technological progress in the national economy." This is, first of all, only partial satisfaction of the national economy's needs in high quality modern equipment. There is not enough responsibility for the technical standards of production, product quality and the level of its competitiveness. The potential of sector institutes and KB is poorly utilized. Development schedules are stretched out unjustifiably as well as is the mastering of new types of equipment and technology. The technical standard of the manufactured products are not evaluated objectively.

The decree posed for the machinebuilders two general problems for the very near future. They also apply fully to the activity of forge-press machinebuilding. Accordingly, the following must be provided: output of machines, equipment, devices and materials that have technical-economical indicators equal to the highest world standard; introduction of progressive technology and advanced methods of organization of production and, on that basis, an essential increase in the productivity of labor in all sectors of the national economy.



In all our work on accelerating scientific technological progress, one of the main directions must be the wide automation of technological processes by using automatic machine tools, machines, devices, standard equipment modules, robot equipment complexes and computers. Robots should be used on a wider scale in this area. And, of course, it is constantly and persistently necessary to eliminate shortcomings in organizing scientific technological work. Radical improvements in accelerating the scientific technological progress are the most important problems for all associations, enterprises, organizations, the "Soyuzkuzmash" VPO and the ministry.

To solve the great problems on accelerating the scale of the output of automatic equipment, it is also necessary to implement broad measures in raising the technical standard of production, reequip enterprises, increase productivity of labor considerably and change production over to a path of intensive development. An increase in the productivity of labor should be the result which is the basic factor in increasing output.

The 1983 plan target on raising the productivity of labor by forge-press machinebuilding plants was fulfilled by 101.4 percent. In 1984, productivity should increase by 5.9 percent as compared to 1983.

The forge-press machinebuilding subsector did certain work on introducing progressive technology, mechanization and automation of production processes. The following was achieved in the three years of the five-year plan period: over 4300 workers were freed conditionally and over 10 million rubles were saved due to a reduction in the cost of production.

At the same time, it should be noted that the work of associations, enterprises and organizations on raising the productivity of labor and, especially, on reducing the labor-intensiveness of the manufactured products still does not meet the requirements of the 26th party congress and the following Plenums of the CPSU Central Committee.

Some enterprises still have a low level of organization and technology of production; they do not have regular production rates and labor time losses are high. Auxiliary and transport-warehousing work are not mechanized sufficiently. The rated productivity of labor has not been reached at the majority of the industrial facilities placed in operation in the last several years. The level of organization of production and labor in intermediate product production facilities has a great effect on raising the efficiency and productivity of labor. However, tasks approved by target programs for developing intermediate product production facilities at forge-press machinebuilding plants are being largely delayed.

A considerable reserve in raising the efficiency of production and the productivity of labor is saving metal and other materials. The decree of the December (1983) Plenum of the CPSU Central Committee demands of us that we raise the efficiency of production further and apply the main thrust to raising the management standard and the fuller utilization of all material, labor and financial resources.



Regrettably, it must be noted that many forge-press machinebuilding plants do not fulfill the tasks on raising the utilization coefficient of ferrous metals rolled stock. This indicates large reserves in the technology of intermediate product production.

The reequipment and modernization of existing enterprises are defined by decisions of the party and the government as the basic road for further development of production. It is necessary to become involved more persistently in the questions of the reequipment and organization of specialized production facilities.

During the three years of the five-year plan period, over 56 percent of all capital investments in industrial construction were put into the reequipment of forge-press machinebuilding enterprises. Special attention is being given to improving the structure of the equipment park. Plans for the comprehensive introduction of progressive technology using new equipment are being effectively implemented in a number of enterprises.

The ratio of another progressive equipment is also increasing in the machine tool park. The introduction of NC machine tools, robotized complexes and automatic lines saved over 700,000 rubles and freed 1280 workers conditionally.

One of the most important problems of the technical services of an enterprise is to increase the utilization coefficient of the high productivity equipment. Special attention should be paid to increasing the shift coefficient of the equipment in basic production. The common problem of all collectives of our sector is to achieve the adopted socialist obligation -- increase the shift coefficient of the basic equipment in all basic production shops 1.5-fold.

For this, a systematic search for possibilities for reducing the number of auxiliary workers and increasing correspondingly the number of machine tool operators is necessary. It is also necessary to introduce multi-machine tool equipment and get rid of unused equipment more rapidly.

It is necessary to disseminate more widely the experience of a number of plants on introducing progressive technological processes of group machining of parts using new equipment. Such machining is being used successfully in robotized flow-lines of the Ivano-Frankovskiy "Karpapressmash" PO and the Pinsk Forge-Press Automatic Lines Plant; machining hydraulic cylinders in the NC machine tool line at the Orenburg "Gidropress" PO; and comprehensive machining of hydraulic cylinders in "processing centers" at the Saratshsk "Kommunar" Press Units Plant. The Stryysk Forge-Press Equipment Plant imeni S. M. Kirov introduced two sets of machine tools and robots for high productivity machining of parts.

New equipment and progressive technology is being introduced at the Sal'sk Plant KPO. While the plant is still not completed fully, here there was created comprehensively mechanized production flow lines of up to 630 kilonewton crank presses and robotized complexes using such presses. The plant

is preparing to place into operation this year a clutch-brake parts section using six "machine tool-robot" complexes and a storage warehouse with an automatic load-addressed stacker. The introduction of such a section will make it possible to free about 30 workers and save over 200,000 rubles. Efficient solutions of problems on mechanizing and automating production processes are incorporated in the comprehensive plans for reequipment in a number of enterprises. Thus, it is envisioned to use widely progressive equipment at the Sryysk Plant KPO imeni S. M. Kirov machine assembly building. This will include 56 percent of NC machine tools of which 18 percent will be "processing centers" and 12 percent automatic and semiautomatic machines. It is planned to create comprehensively mechanized sections for unit assembly controlled by computer and organize flexible production systems.

Considerable experience was accumulated in forge-press machinebuilding on organizing centralized production of units and parts. As a result of organizing, the labor-intensiveness of their manufacturing was reduced by 335,000 norm-hours in 1983 alone. Centralized production should be developed in every possible way and on a larger scale.

Plant KPO are carrying out a considerable amount of work on developing the production of various kinds of intermediate products (castings, forgings, stampings and welded structures).

In 1982, the Azov Forge-Press Automatic Machine Tool Plant completed the construction of a building for finish machining of castings which made it possible to place in operation a capacity for producing 5000 tons of additional castings per year. The building is equipped with high productivity machines with maximum comprehensive mechanization of all operations.

The positive experience of the Azov Plant was adopted by the Orenburg "Gidropress" PO. A number of other plants are installing similar equipment.

The Voronezh PO for KPO Manufacturing imeni M.I.Kalinin organized an experimental section to manufacture precise castings by the vacuum-film molding method. This technology makes it possible to produce precise low waste castings in automatic lines and installations.

The "Soyuzmash" VPO plants did a great amount of work on mastering the very durable new polymer coatings for pattern cores, developed in cooperation with the GPTIkuzmash institutes (Voronezh) and the INEOS [Organic Element Compound Institute] imeni Nesmeyanov of the USSR Academy of Sciences. The new coatings, using silicon-organic compounds and introduced by the majority of plants in full production volume doubled and tripled the life of casting patterns and make it possible to save up to 50 percent of scarce, high quality lumber.

Welded metal structures, whose ratio in the total volume of cast and welded intermediate products is 38 percent, are used widely in forge-press machinebuilding. However, the rate of welding production development is not high enough. The tasks of the comprehensive target program are being met with delays. Reequipment in forge-stamping production is not being implemented rapidly enough. The introduction of new capacities for producing forging from

castings is delayed at the Sal'sk KPO Plant and at the Ryazan' "Tyazhpres" PO. The situation must be improved in the remaining two years of the five-year plan period. Constant attention should be given to the development and reequipping of the intermediate product base at the subsector.

Workers in the machine tool and tool industry, guided by the decrees of the November (1982), the June, December (1983), February (1984) Plenums of the CPSU Central Committee, will apply all their efforts, experience and knowledge to fulfilling and overfulfilling the tasks of the fourth year of the five-year plan period and the adopted socialist obligations. They will make a worthy contribution to strengthen further the economic and defense power of the Soviet Union.

All labor collectives of the "Soyuzmash" VPO, having developed socialist competition for fulfilling and overfulfilling planned tasks for 1984 and the 11th Five-Year Plan period as a whole, adopted higher obligations. Productivity of labor will increase 1 percent above that set by the state plan, and the cost of production will be reduced by 0.5 percent. It was decided to complete the annual plan for the volume of production by 27 December 1984 and produce commercial products in an amount of 4.9 million rubles above the annual plan.

The entire increase in the volume of production must be provided for by increasing the productivity of labor.

Implementation of the adopted socialist obligations is a worthy contribution to the development of forge-press machinebuilding.

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## INDUSTRY PLANNING AND ECONOMICS

### BULGARIAN MACHINE TOOL PLANT EXPORTS CHIEFLY TO USSR

Sofia ECONOMIC NEWS OF BULGARIA in English No 6, 1984 pp 4-5

[Text]

The combined works POBEDA for machine tools was founded in Sliven in 1977 as a subsidiary of the ZMM Economic Organisation in Sofia, but its base works — Pobeda — can trace its existence back to 1882. Nowadays it consists of three divisions: the Pobeda machine-tool works as the central plant, the Sliven Works for Machine Tools, and the one in Nova Zagora; one should add the Institute for Machine Tools in Sofia which specialises in developing automatic technology lines and NC lathes.

The Combine has its first division (echelon) in Nova Zagora which makes axles, shafts and gears to orders from the Combine and the other works under the same ministry. The second division (echelon) is the Machine-tool Plant ZMM Sliven which makes universal lathes, and since 1980 has been building Computer Numerical Control (CNC) machines or production lathes of the SP 586 type. The base works Pobeda which is also the largest, makes products in three lines; textile units for looms for our integration with the Soviet works in Cheboksary and Klimovek; automated technology lines and transport-feeding devices for the country and for export mainly to the USSR; and finally, production lathes with power-numerical control and machining centres also with power-numerical control for the country and for export.

The production of ZMM-Sliven, especially its universal lathes, find a ready market both in the USSR, Poland, Czechoslovakia and Hungary, as well as in Italy, West Germany, Canada, France, Sweden, Singapore and other countries. The base plant Pobeda exports about 80 per cent of its output, chiefly to the USSR.

The Institute for Machine Tools which is a subsidiary of the institute of the same name in Sofia, caters for the needs of the Combine by providing it with newly-developed automated technology lines, lathes and NC lathes. A pilot shop has been set up under the Institute, where prototypes and pilot models are made together with the technological equipment that is transferred, together with the pilot product, for regular manufacture in the works. The Institute also develops structural documentation for factory transport and feeding devices — both after Soviet blueprints adapted to the needs of the Combine, and after its own designs.

The Machine Tools Plant in Sliven builds a number of machines for domestic needs and for its numerous customers abroad:

Universal lathes SU 400, SU 500, SU 500M, SU 580M

Maximum diameter of machining: 440 mm, 500 mm, 580 mm (Swing over bed)

Main motor power: 7.5 kW, 1 kW

Number of feeds: 80  
 Number of threads: 64  
 Lathes SU 505, SU 585  
 Maximum diameter of machining: 500 mm, 580 mm  
 (Swing over bed)  
 Main motor power: 7.5 kW; 11 kW  
 Number of feeds: 135  
 Number of threads: 72  
 Lathes SU 803, SU 1003  
 Swing over bed (max dia. of machining): 800; 1000 mm  
 Main motor power: 22 kW; 3(kW)  
 Production lathes SP 505; SP 585  
 CNC lathes SP 506; SP 586  
 MANUFACTURERS:  
 ZMM SLIVEN  
 Phone: 2-66-95/58  
 Telex: 86536  
 EXPORTERS:  
 MACHINOEXPORT

As a result of long years of experience in building machine tools, the Pobeda MT Combine in Sliven mastered the production, over the past decade, of several systems of automatic factory transport from operation to operation. These systems have served as the components of numerous automation complexes realised at home and abroad. Some of them: a roller conveyor system for automatic transport between operations (capacities: 20 kg and 50 kg); a chain conveyor system of automatic workpiece transport with a capacity up to 150 kg, and a step conveyor system with a

capacity up to 50 kg and 100 kg.

These systems are open to completion with new devices and mechanisms which could expand their versatility. Usually the concrete specifics require one of these systems as the most suitable but there are cases when the systems must be combined. The following groups of automated devices are combined:

gravitational or powered conveyors for palletised and non-palletised handling;

devices and mechanisms for the feeding and unloading of conveyors and of the technological equipment (machines);

mechanisms for cutting off, separating, gathering and re-orienting in space the transport streams;

devices and mechanisms for technological and checking operations on the very conveyors.

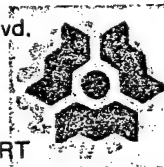
Precision finish, reliability, high accuracy: these are the basic characteristics of machines with the Pobeda Combine label.

MANUFACTURERS:  
 POBEDA COMBINE FOR MACHINE TOOLS  
 SLIVEN

Dimiter Dimov Blvd.  
 Phone: 8-20-11  
 Telex: 86511

EXPORTERS:  
 MACHINOEXPORT

SOFIA  
 5 Aksakov str.  
 Phone: 88-53-21  
 Telex: 023425/26



CSO: 1812/19

## INDUSTRY PLANNING AND ECONOMICS

### SOVIET TECHNICAL DIRECTOR ON USSR-GDR COOPERATION

Frankfurt/Oder NEUER TAG in German 10 Sep 84 p 5

[Interview with Anatoli Gavsinskij, technical director of the tool-grinding machine plant "S.M. Kirov" in Vitebsk, partner [city] of the Bezirk Frankfurt/Oder: "Precision Machinery Requires Precision Work" by Jochen Koch; date and place not specified]

[Text] [Question] Walking through some of the production departments, we were struck by the modern technical equipment. What does the factory produce?

[Answer] We are the sole producer of precision surface grinding machines, of tool-grinding machines without spindles in the Soviet Union. Since 1975, we have been producing computer-guided work benches which are capable of carrying out 30 different work operations. They are needed, for example, for the grinding of automotive valves, or the processing of ball bearings. In this instance, the range is from 0.3 to 102 mm diameters.

At the moment we are preparing the production of the fourth generation of these computer-guided machines. What is special is that we produce these aggregates in mini-series. Last year, there were 154 variants which were developed to customers' specifications. Sometimes, only one or two machines of a given type are produced.

[Question] Sole producer of these precision tools--that is a special responsibility?

[Answer] Yes, but our 3,700 workers--among them 1,000 women--fulfill this responsibility for our country as well as for the entire CEMA area. The replacement rate of more than 20 percent annually places high demands on training and qualifications. We try to solve almost everything ourselves in the factory, from production preparation to creating our own efficiency measures.

In this, we can rely on a core of highly qualified skilled workers who are certified in two or more occupations and can be flexibly employed. We have whole worker dynasties, such as the Risor family, where grandfather, father, sons, and grandsons work in the factory. This develops ambition and professional pride. Demanding tasks are taken on by 450 innovators. Precision machines demand precision work.

[Question] What part is played by the technical professionals?

[Answer] In keeping with the demanding tasks, they also show a very high level of qualifications. More than 700 graduate engineers and several doctors of technical science work at our plant. Of the 120 employees of the department of principal technology, for instance, more than 70 percent hold a university degree.

But we also care about our own rising generation of employees. The plant has its own vocational and technical schools associated with it. And we are not just "stewing in our own juice," as could be supposed of a sole producer. We have fruitful relations with project institutes in Moscow and Minsk.

[Question] Surely, your products are in demand?

[Answer] We export to more than 30 countries, including all CEMA states where, as a sort of leading industry, we have a special responsibility for the specialization and cooperation within CEMA.

So far, we have supplied 12 of these precision machines to the GDR. This year, three more will follow. We already have orders on hand for 1985.

We are proud of the fact that our exhibits won a gold medal at the Leipzig Spring Fair of 1984. We also received high awards at the international fairs in Budapest and Bucharest and at the All-Union exhibit in Moscow.

[Question] Good work is also profitable for the workers?

[Answer] That's right. This is an important aspect of socialist competition. More than 300 workers in our factory have already fulfilled their personal 5-year-plan target. The average earnings of a skilled worker are 250 rubles per month, top workers earn 300 rubles. A good worker can earn up to 40 percent more in bonuses for overachievement of the plan and correspondingly high quality. We place particular emphasis on quality.

[Question] Do you also produce consumer goods?

[Answer] In coordination with other Vitebsk factories, there are 24 different kinds of consumer goods we offer to the people. This ranges from hand drilling machines to gardening equipment and fishing rods for ice fishing.

[Question] What relations does the factory maintain with the GDR, particularly with the bezirk Frankfurt/Oder?

[Answer] I already mentioned our exports to the GDR. But it is not a one-way street. There is a mutual give and take, as is usual among friends. In our factory we employ 20 high-capacity, numerically-guided machine tools from the GDR, and our workers are very satisfied with them, since they aid in attaining high quality parameters. We maintain relations with the state enterprise Mikrosa, a factory of the state-owned machine tool combine "Fritz Heckert" in Karl-Marx-Stadt.

Unfortunately, there is no such factory in the bezirk Frankfurt/Oder, but we have close contacts with our partner area. Colleagues who visited the Oder Bezirk appear before the collectives, report on working and living conditions, tell of their experiences. This year, too, four of our workers visited the Bezirk Frankfurt/Oder with the 6th friendship train. The 35th anniversary of the GDR will be marked by festivities in the factory.

9917

CSO: 1826/34



## INDUSTRY PLANNING AND ECONOMICS

### SKILLED LABOR SHORTAGE IN NOVOSIBIRSK ANALYZED

Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 28 Aug 84 p 2

[Article by V.Kazarezov, secretary, Novosibirsk obkom of the CPSU: "Who'll Operate the Machine Tools?"]

[Text] The progressive shift in the structure of metal-working equipment notwithstanding, 84.5 percent of it today still consists of machine tools. Consequently, turners, milling, planing, grinding drilling and other machine operators will long comprise the main body of the working class in machine building. The way it is reinforced, replenished by qualified and disciplined cadres, the question of who will replace the older generation will be a crucial factor in deciding whether our plans are fulfilled and the goals facing us achieved. This, then, should be the prime concern of party organs, plant managers and public-organization leaders in the field of machine building.

We undertook a detailed study of the situation in a number of machine-building plants in Novosibirsk. Frankly speaking, the picture that emerged was not good, serious corrective measures are definitely in order. Whereas the number of machine tools increased 18.5 percent in ten years, the number of operators dropped 6.9 percent over the same period. It is obvious that a deficit of this magnitude leads to breakdowns in the work of assembly shops which do not get needed parts on schedule and must resort to crash work to make up for lost time. Of course, this adversely affects the quality of the product. Over the past few years it has practically become the rule for a combine, machine tool, any mechanism off the conveyor to be brought to completion by the consignee after delivery.

Some may demur: this is a long-standing problem known to all, and it is not so much the fault of plant managers as their misfortune. Maybe so. But the situation as it stands today demands that machine operators receive even more attention and care, that we do our utmost to ensure their preservation as a group and, more importantly, their rational utilization.

As is well known, when it comes to training machine operators we pin great hopes on the system of vocational and technical education.

Today, however, these schools account for no more than 22 percent of trained workers, even less in Western Siberia - 8 percent. But even this is not the crux of the matter. At the beginning of the 1970s a study was conducted to find out how the graduates of two Novosibirsk vocational schools servicing the Sibsel'mash and Precision Machine Building plants had fared in their jobs. This is the picture that emerged: out of 200 turners at Sibsel'mash only 32 were still with the plant, and only ten of these had not switched professions. Out of 187 milling machine operators only 42 were still on the rolls, but 14 of them were working in other specialties. Overall only 14 percent of these two schools' graduates had stayed with their assigned plants, with only 9 percent retaining their original specialty.

Another study undertaken 10 years later revealed an even sadder picture: a mere 11 percent of vocational school graduates had stayed on at their plants. It is worth noting that the turnover figure for young machinists are on the increase at a time when the turnover index for Novosibirsk oblast as a whole is on its way down.

At the root of this phenomenon is a whole set of reasons. The machinists's work has become more intense because of an increase in cutting speeds, stricter demands are imposed on the quality of the workpiece in terms of both precision and smoothness. At the same time machining easily lends itself to technically sound norm setting whereas the work of an assemblyman, regulator, tester and other such specialties is evaluated through empirical-statistical norms. As a result, with the pay roughly equal the machinist expends substantially more physical and nervous energy. On the other hand, the young generation's higher general-education level comes into contradiction with the lack of opportunity to apply it inasmuch as flowline production does not require a high degree of knowledge.

The shortage of machinists fetters the development not only of machine building, but of other industries as well. It is also the cause of the slow pace at which scientific and technical innovations are incorporated into production. The way we see it, the approach to the solution of this serious state problem should be a multifaceted one, that is, it should embrace the technical, organizational and social aspects of the issue.

First, the process of changing the componential structure of metal-working equipment must be intensified: the proportion of metalcutting machines should be reduced and that of forging and pressing mechanisms and casting equipment correspondingly increased. In metal-cutting machinery preference should be given to digitally programmed machines, processing centers, robotic complexes; conditions must be created for the organization of flexible automated production lines. Taken together, all this should compensate for the dearth of machinists.

In Novosibirsk oblast this work is coordinated by a Council for technical progress set up by the party obkom. Flexible automated production lines (GAPs) are the responsibility of a specially organized sector which is working on an oblast-wide program to develop GAPs and to unify efforts by industrial enterprises and scientific organizations to see it through. Held in Novosibirsk in July was a scientific and practical conference on "The achievements and prospects for the creation and the utilization of automated production lines at oblast enterprises". The conference summed up the experience gained in this endeavor and drew up recommendations on how to intensify the process.

The second path to the solution of the problem is to utilize the cadres on hand in a solicitous, rational manner, enhance their professional stability and improve the machinists' training system. We place much hope for success in this undertaking with the further development of collective forms of work organization. As is well known, in addition to the obvious economic benefits such as increased productivity the brigade contract carries with it a substantial social effect. Working in a brigade, the recent vocational school graduate can count on stable earnings, he has more opportunities to hone his professional skills. No less important is the fact that the comprehensive brigade with its variety of professions allows its members to alternate jobs and thereby largely eliminate the monotony of a fixed routine.

The experience gained by Novosibirsk enterprises is the basis of an experiment now being conducted by the State Committee for Labor and Social Problems and the All-Union Central Council of Trade Unions at the request of the oblast party committee. This is an attempt to apply the collective contract principle to structural subdivisions of a higher order - the shift, the section, the shop and, in perspective, the enterprise. In addition to production line workers the collective will include auxiliary workers, technicians and engineers, including supervisor personnel.

Of course, the problem of cadres cannot be resolved without improving their training. We have in mind the question of professional orientation. In our oblast this work is conducted by interschool production combines and, in the schools themselves, directly by sponsor enterprises. Organized outings to the plants are standard procedure, theoretical instruction goes hand in hand with work on the machine tools. As a result, many schoolchildren subsequently take jobs at the plant in question or enrol at educational institutions specializing in their chosen field.

However, professional orientation not infrequently boils down to sermons on the merits of the trade which are not supported by professional selection. This creates an illusion of well-being, at least for a time, then it simply fades away. Because the young

people "cajoled" into the profession of machinist break away from it as soon as their own personal experience provides them with a broader understanding of what it is all about.

Enterprises that have come to realize the need for a comprehensive approach to the problem of machinist cadres have achieved significant successes in forming stable collectives, reducing labor turnover. A case in point is the Novosibirsk Instrument plant imeni Lenin. Much is being done here to switch to the pressure casting of details, thereby reducing the volume of machining operations. The plant is rapidly installing new high-productivity equipment - digitally programmed machine tools, processing centers, automatic and semiautomatic machines. An automated section has been created to work complicated casings. All this results in the freeing of a sizable number of machinists for other jobs. The plant devotes a good deal of attention to the problem of holding on to its cadres.

The Aircraft plant imeni Chkalov, the Electrosignal and other enterprises have found effective ways to deal with the professional orientation, selection and adaptation of young workers. The fruits of their practical experience and the active dissemination thereof allow us to look to the future with optimism.

12258  
CSO: 1823/11

## INDUSTRY PLANNING AND ECONOMICS

### PROCUREMENT, UTILIZATION OF NEW MACHINE TOOLS MISMANAGED

Moscow TRUD in Russian 20 Apr 84 p 2

[Article by N. Semenets, engineer of the Dnepropetrovsk plant of mining equipment, central energy section and member of the people's control group: "They Bought Machine Tools and...Threw Them Away"]

[Text] I think about what is happening at our plant and cannot in any way understand the reason for the careless, disinterested, simply barbaric way of caring for the public welfare. In outward appearance the story is simple: they buy the newest equipment, including that from abroad, spend huge sums of money and then this equipment stands idle for years, without being put into use. The money spent is not the mythical kind, but completely real, state money, that is, yours and mine. Who gave the right to throw it around left and right? I see in this still another problem--not only purely an engineering problem but one which is moral, ethical. If a specialist, a plant engineer can calmly walk by a machine tool that has stood idle for years, if his heart does not ache, if his soul is callous, he has "become accustomed," "habituated" to such scenes, what kind of morals does he have, what are his convictions, principles?

I am unable to make up my mind about this confession. Nevertheless, I'll tell everything in order.

In 1966 shop No 2 acquired a generator for the high-frequency tempering of parts. It costs about 17,000 rubles. But at the plant they determined that it would pay for itself, the new equipment would be able to raise the durability and quality of the parts.

I must say that to install a large piece of equipment at our plant is not simple. The fact of the matter is that the enterprise is situated in that part of town where there is loose soil and a high level of ground water. Therefore it is necessary to carry out expensive and complicated measures to lower the water table and build a strong foundation. Another time it was precisely this circumstance and the deficiency of the means for construction work that hindered the introduction of contemporary highly productive equipment. In this case the money was not spared. The generator was installed. And...they all rested content with this.

The years went by, 5 years, but not one tempered part was to be had from the installation. At first something went wrong with the adjuster, and then it was given up as completely lost.

It seems to me that anyone who has ever had to work in production knows very well what happens to equipment that remains idle. It is gradually "stripped." Steadily they take off gears, automatic devices, relays, bearings. In one shop one part is used, in another they decide to use another piece. Before you know it, a carcass and bunch of knots is all that remains of the modern machine and not one person can save it. The ill-fated generator, bought abroad for a lot of money, was not able to escape this fate.

After 10 years, in 1976 they obtained a high-frequency hammer for this same shop. The machine was excellent. It was productive, economic and capable of making forgings of the highest quality and exact geometric measurements.

The hammer also cost a lot; 111,000 rubles. Add to this sum the expenditure for lowering the water table, the foundation, mounting and adjuster and you will easily understand the sum necessary for the plant to want to keep pace with technical progress.

The hammer remained idle 3 years. They said that there were no furnaces which would have prepared metal for it. In order to start up the expensive machine, they bought and installed two thermal stoves and one warming stove of modern construction.

Since then much time has passed and at this technical complex, which consists of a hammer and three furnaces, not 1 kilogram of metal has yet been processed. Again something did not get done, was not obtained. I see that these expensive machines await a sad future. They have already begun to strip them quietly....

Unfortunately, there is plenty of idle equipment in other shops. In one, for example, there is a welding outfit, a plate bending machine, and a cutting tool. In a third, a chill mold machine. In a fourth, several metal cutting machines. In a sixth, an expensive and scarce lathe with numerically programmed control. This sad list could be continued.

Thus, even in a brief overview of the basic shops I discovered more than 20 units of idle equipment with a total value of about 400,000 rubles. If you add the money spent on the installation and mounting, then clearly, you can double this sum.

This is not the first year I have been working as an engineer and I understand well that the machine park of an enterprise is not something frozen and constant. Time passes, the equipment ages, it needs to be exchanged and modernized. New equipment appears. That which is not needed is written off, sold, transferred to another enterprise, kolkhoz, sovkhos. In a word, it is necessary to work with equipment.

I was not silent about my "discoveries." I spoke about them, compiled lists, wrote reports. But in vain; nothing changed. I thought, well here will go certification of work places for the experience of the collective of the combine plant--the business will come to a halt. But no! If you believe the reports, then certification of work places at our plant took place last year. The economic effect of it would hardly be felt. But, it seems to me, the facts that I revealed undoubtedly proved that this work was carried out formally at our plant, only for the report.

When they did not pay attention to my reports, I decided to write to TRUD. I did not hide my intentions and let my direct superiors know about them.

The result followed quickly. One day the much suffering high frequency generator for tempering parts was thrown in the street. And then it disappeared to who knows where. They concealed this further from commissions, inspections and the eyes of unnecessarily curious engineers. Is this a solution?

From the editor:

Our TRUD correspondent in Dnepropetrovsk, I. Ostrovskiy asked the head engineer of the mining equipment plant to answer the question: "Why are the basic production funds handled so carelessly at the plant?" "Actually," said Aleksandr Borisovich, "there is a lot of idle equipment at the plant. There are many different reasons. There is the high velocity hammer which was spoken about in the letter. It stands in the shop like a monument, does not produce any output. It turned out that it was impossible to produce the majority of our parts with it. An excellent lathe, VMG-5000, is idle. It would have been capable of servicing 42 lathe posts simultaneously. But we were afraid of transferring to it and leaving the manual lathe posts. If it broke down, all lathe work would stop. We need yet another such machine."

"Why do you buy equipment which is impossible to use in the enterprise?"

"I don't know," answered the chief engineer. "I'm new here."

It seems that such an answer cannot be satisfactory. It works out that some plant leaders allow mistakes, and others do not intend to correct them.

The position of the VPO [All-Union Production Association] Soyuzgormash of the USSR Ministry of Heavy Machinery evokes bewilderment. It turns out that VPO specialists do not have any idea about what is going on in the plant. And if they know, then how could they permit the purchase of the expensive and unnecessary, in the words of the chief engineer, equipment! Is it really impossible to use it at the plant!

12596

CSO: 1823/254

## INDUSTRY PLANNING AND ECONOMICS

### USE OF HIGH TECH IN INDUSTRY MODERNIZATION URGED

Moscow PRAVDA in Russian 29 Aug 84 p 2

[Article by A. Kamenev, deputy chairman of the USSR State Committee on Science and Technology: "Machinebuilding Should be in Vanguard"]

[Text] Several necessary conditions were established in our country to increase the systematic development of the machinebuilding sector of industry. They were assigned a certain role in intensifying the economy of the country. But to be in the vanguard machinebuilders must solve strategically important problems related to the rapid modernization and development of their own capacities by using comprehensive automation and the most advanced technology and organization of production. Such capacities must be capable of producing not individual machines, but machine sets providing their further servicing in operation. Machinebuilding output should be adapted to using resource-saving technologies at the level of modern achievements.

In the last 10 years, the output of the means of automation and devices increased 2.4-fold; of computers almost doubled; the output of automatic and semiautomatic metalworking lines increased 1.5-fold; and the relative share of NC machine tools increased in the total volume of their production. Since the start of the current five-year plan period, about 25,000 industrial robots have been manufactured, the output of microprocessors tripled and of microcomputers more than doubled. At the start of 1984 about 3300 technological automatic control systems were in operation in the country as a whole. But this may be considered only as a basis for solving new and intensive problems posed by the CPSU Central Committee and the Soviet government.

Now, when scientific technological programs are being prepared for the 12th Five-Year Plan period, the main efforts of the USSR State Committee on Science and Technology are directed toward the selection of resource-saving technologies, promising equipment and new efficient forms of utilizing scientific technological potential. This work is being done in close cooperation with the USSR Gosplan, the USSR Gosstat, USSR Academy of Sciences, the All-Union Ministries and Union Republic Councils of Ministers along with a wide group of scientists and specialists. Norm documents were developed to form sector and republic scientific technological programs on that basis.



The goal is to correlate more closely a single state and industrial scientific technological policy with the solution of economic and social programs, and with accelerated reequipping of all sectors of the national economy. At the same time, it will be necessary to correlate programs and plans precisely for new equipment with plans for capital construction, production, material-equipment supply, as well as with efficient and timely application in the national economy of the results of completed scientific research work, and with increased efficiency of the activity of the NII [Scientific Research Institute] and KB [Design Bureau]. Scientific research and experimental design work is being concentrated in large institutes; measures are being taken to eliminate weak organizations and branches that are incapable of doing efficient and comprehensive research at the state of art. All these measures, we hope, will facilitate an increase in the economic effect of introducing new equipment per ruble of expenditures.

At the same time, it is necessary to point out that there is still insufficient activity in a number of sectors in the fight for the reequipping of production, and attempts are still being made to solve new in principle problems by customary methods. Thus, almost half the ministries do not implement plans for new equipment. Moreover, many of the plans require serious review in order to become efficient tools for correcting scientific technological policy in machinebuilding whose primary problem is the reequipping of its own production capacities for manufacturing new, highly efficient equipment in the planned amount. It is well known that a rapid rise in the technical standard of the metalworking equipment in combination with modern automatic control systems changes the very organization of machinebuilding production radically, unavoidably creating a number of great problems.

Thus, automation of machinebuilding sectors envisions a changeover to comprehensive modernization and reequipping of basic capacities with a sensible expansion of production by new construction. Here, it is very important to develop technical projects of such a level that, on one hand, they be based on the latest technology and equipment and, on the other hand, they should incorporate methods to organize production which would make it possible to avoid being incomplete, include optimal transportation-warehousing facilities that would insure delivery of parts and complementing products for assembly on a strictly determined schedule. The assembly process itself should eliminate long conveyor lines -- assembly should be done in parallel. Modern computers will make it possible to realize such principles successfully in designing new production facilities, as well as when modernizing existing ones.

Our committee implements systematic work on evaluating the technical standard of the technological part of most important projects. However, the basic load of creative work in introducing novelties is laid on sector ministries and main planning-technological institutes.

The possibilities of further intensification of production processes and increasing unit capacities of machinebuilding equipment make it possible to pose the problem on a 2 to 2.5-fold increase in the productivity of labor at the same time reducing the need for basic equipment to 1/5-1/8 as compared to the universal equipment.

It is impossible to obtain such indicators by the simple addition of uncoordinated universal equipment on which the development of machinebuilding sectors was based 10 to 15 years ago. In the given case, the effect is obtained by using high productivity, flexibly readjustable equipment and automatic control systems.

However, such equipment cannot be created by customary methods. While universal equipment can be designed within the framework of one special design bureau, the creation of flexible production systems demands the wide participation of specialized enterprises that develop the basic equipment, control systems and software, i.e., a large scale coordination of work is required that is beyond the boundaries of one sector. Here, the main developer carries essentially the responsibility for the quality of work of associated people. While one specialized plant can manufacture a machine tool, to create a flexible production system requires centralized planning and development, and has to be produced at enterprises of several sectors. And further -- specialized servicing must be provided that guarantees the efficiency of the entire technological line.

And, finally, demands of the operational personnel have changed. While using universal equipment, the great skills of basic workers are combined with auxiliary, low skilled workers, the operation of modern production systems requires the brigade form of labor organization. Here indicators of all brigade members must be oriented toward the final results.

The very terms "auxiliary production" and "auxiliary work" now become anachronistic, because intensification of production under modern conditions is based on principle of the comprehensiveness of technological processes where the links require an equally intense and scientifically substantiated approach.

These conditions pose special problems for leading ministries, responsible for the manufacture and introduction of progressive metalworking equipment. Their specialization was determined by the respective decrees of the USSR Council of Ministers. They were entrusted with carrying out a single technical policy in creating the equipment assigned to them. It was also specified that positions of general designers be established who would be personally responsible for the basic types of metalworking equipment.

The creation of necessary conditions for the rapid incorporation of new developments into metalworking runs into great difficulties. Shortcomings in the development of the experimental base of machinebuilding sectors are being eliminated slowly. Thus, up to 40 percent of the NII has no bases for doing experimental finishing off. At the same time, tasks on building experimental facilities are being implemented unsatisfactorily. Low-tonnage production facilities of new including superclean, material are being developed intolerably slowly.

Proven experience in creating comprehensive automatic metalworking systems was already accumulated in machinebuilding. Enterprises of the Ministry of the Machine Tool and Tool Industry, the Ministry of the Electrical Equipment

Industry, the Ministry of Instrument Making, Automation Equipment and Control Systems have such systems. Thus, the Dnepropetrovsk Electrical Locomotive Building Plant created an automatic metalworking shop by using existing equipment with NC machine tools. Its reequipment made it possible to increase the productivity of labor 3.3-fold. However, there are still cases of inefficient utilization of robots, and the introduction of single units of processing centers in production facilities is planned in the old way.

There is only one solution and that is a full changeover of such shops to using robotized complexes with highly skilled servicing. Any other approach leads to large material losses, discourages interest in the new equipment and delays its introduction artificially. This is why many industrial robots built by the Ministry of Instrument Building lie idle in warehouses; managers of some enterprises prefer to order universal equipment instead of modern NC machine tools and processing centers. According to the USSR Gosstat data, this trend is still present. This means that extensive and tedious work is required in ministries to achieve an efficient modern single technical policy carried out by an authoritative head institute, guided by a prominent scientist, specialist and organizer--the general designer.

Of special importance in its implementation is to provide equipment of proper technical standard and quality. In fact, failure of any link in the metalworking technological line leads to its stoppage and frequently also to accidents. The consequences here are independent, as a rule, of the cost of parts, units, and circuits that failed. Therefore, it is necessary to be concerned equally about the functioning of all component parts of the technological line. The large number of suppliers and their geographic locations reduce promptness in removing shortcomings detected in installation and operation.

The situation is complicated by the fact that the equipment suppliers are responsible only for the quality of their own products and are concerned little about the strict provision of rated indicators for the entire technological line. Special measures are required to increase the moral and material interest and responsibility of managers and collectives of component part suppliers in obtaining the rated indicators on the planned schedule, as well as guaranteeing its efficient operation. This means that suppliers must increase the volume and quality of machine service work. In this connection, it seems that the time has come to introduce such an indicator in the production plans of enterprises.

Of special importance is the measure in the decree of the CPSU Central Committee and the USSR Council of Ministers "On measures to accelerate scientific technological progress in the national economy, which specifies that industrial output be certified for two quality categories: highest and first (instead of three as was previously done). The State Committee on Science and Technology together with the Gosstandart and machinebuilding industries are already carrying out this work. The most attention should be given to the output most important to the national economy. A procedure was also set up, according to which machinebuilding products (except untransportable) proposed for the emblem of quality certification must be exhibited at the USSR VDNKh for evaluation by the broad segment of the public. The award of the emblem of quality is

accompanied by efficient forms of moral and material incentives. At the same time, a reduction in price of up to 30 percent is also envisioned for products not certified for the highest or first category. This procedure was already set up by central departments and is beginning to operate.

Here is another consideration. When we deal with modern technological lines which can function only with timely delivery of the entire equipment complex, clear-cut implementation of the principle of delivery in a complete set is required. Domestic machinebuilding has successful experience in solving this problem. Thus, enterprises of the Ministry of Chemical Machinebuilding have already supplied customers with complete sets of equipment for 10 years. This experience was approved by the CPSU Central Committee and was recommended to other machinebuilding sectors.

The intensification of the economy of our country is complex and multifaceted work. It must be based primarily on accelerating scientific technological progress in machinebuilding sectors. It requires constant attention, the ability to look ahead and is unthinkable without active positions and initiative on the part of managers, scientists, engineers, technicians and working cadres. Everybody must work with full creative yield. In particular, in the remaining time of the current five-year plan period, it is necessary to formulate in all ministries and departments, in each NII and at industrial enterprises comprehensive plans to solve problems posed by the CPSU Central Committee and the USSR Council of Ministers on intensifying the country's economy in 1986-1990. Machinebuilders must be in vanguard. Then, scientific technological progress will gather higher and higher rates.

2291

CSO: 1823/56

## METAL-CUTTING AND METAL-FORMING MACHINE TOOLS

### DISREPAIR OF NC MACHINES AT KAMYSHIN PLANT VIEWED

Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 24 May 84 p 2

[Article by I. Mordvintsev and V. Fedorkov: "Enterprise or Squander?"]

[Text] It all began with a letter describing the conditions at the Kamyshin Crane Plant, which reported that the latest NC machines were misused, and often left idle due to poor maintenance, and that the wages in this section were low, which was agitating many workers. The workers spoke in the relaxed atmosphere of a section collective meeting:

"That much is true. A few things could also be added. For instance, the machines can wait 6 months at a time and more for installation. And some of them are picked to pieces by pilferers because they are left completely unattended, which means we have to hunt up spare parts for them all over the country."

Just such a conversation occurred in the presence of the plant director A. Pochitalin, who did not raise an eyebrow. Instead he addressed the workers with exhortations, claiming that though there were difficulties, persistent efforts must be made to surmount them, and that soon, order would soon finally prevail at the plant.

Returning to the plant immediately after the discussion, we observed more than 20 NC machines. Perhaps one in five of them was "turning" while the others were idle and without an operator. Having caught our glances, the director quickly explained, "You know, today is not exactly an exemplary day, it is the beginning of the month. And some of the operators are having their days off, and others are working on daily reports. Some of the machines are being repaired...."

Anything is possible, of course. But four-fifths of the plant facilities standing idle? We inquired the director about the machine shift coefficient. "1.2," he answered. In other words, the machines were operating at normal load only during the first shift, and in the second, 80 percent of them were idle. This is not a satisfactory figure even for ordinary equipment. Does a prudent administrator take such an attitude to progressive equipment?

We are not the only ones to have arrived at these disquieting conclusions. The Party commission of the Kamyshin gorkom has also inspected the plant

and prepared an official report citing the same faults. Nonetheless, first secretary of the gorkom V. Zharskiy expressed genuine, and respectful surprise: "Arnol'd Mikhaylovich arrived at the plant only 4 years ago from Bryansk, and demonstrated himself to be an extremely energetic leader. This was primarily evident in his successful efforts at replacing practically all of the plant equipment. He made five personal appearances at the ministry in order to accomplish this. And consider, each time he got what he wanted!"

"It is an exaggeration to say that all of the old machines were replaced at the plant," corrects A. Pochitalin, "but 20 percent of the machinery park was actually replaced with new equipment. And what else could I do? I was given a plant which could not accomplish metal working. There was a disastrous shortage of machine tool operators. For this reason I sought high productivity equipment. Now the labor force shortage is not a problem for us.

The labor force problem. What plant director has not been afflicted with it? The problem is solved by various means: some directors improve the working conditions and the plant organization, in order to retain workers, and to utilize each minute that they are on the job, and others emphasize living conditions and social welfare. Arnol'd Mikhaylovich Pochitalin made advanced equipment his stake. And this approach could be congratulated if it were not for one "but." Progressive equipment is a costly gratification as a rule, and can only be justified if one requisite condition is met: that this equipment gives full return on the investment made in it.

Words cannot even begin to express the intolerable idleness of NC machines during work shifts at the Kamyshin Crane Plant. And the fact that it occurred to no one at the factory to assure the machines were operating at their full capacity is still not what is really wrong here.

Since increased labor productivity is gauged by how many workers are eliminated, what, then, has this new equipment contributed to the plant? We heard no substantial response to this question, other than the much quoted explanation of the machine tool operator shortage. Finally someone cheerfully recalled that some estimates made by the VPKTIstroydormash were lying about somewhere. They hunted up the document and explained that the implementation of an NC machine tool, it appears, should provide the plant a guaranteed additional profit of 150,847 rubles per year. At this point the deputy chief plant engineer Yu. Fabrichiev frankly admitted that in all 3 years no one at the plant had reckoned what economic effect the plant had actually derived.

How can it happen that there was sufficient time and effort to "win" expensive machine tools, but insufficient effort to provide them with kopeck blanks? Expeditors are sent after them, and quite frequently dispatch their prize to Kamyshin by aircraft. Then there are the endless resetttings, idle equipment at the start of the month and workers' days off at the end of the month. Even a work team would be hard pressed to get going in these conditions. The order requiring the implementation of work teams was issued 3 years ago, but team leader A. Stepanov today considers this document pure

fiction: what kind of team will you have when its members are allotted idleness more than work?

The workers are dissatisfied with the wages. The wages at the NC machine tool section are actually lower than in other parts of the plant. Even these wages cannot be considered as enough, explains head of the OTiZ chief M. Podgaynova.

"We have had to implement," she complains, "the time rate plus bonus wage system, which permits us to withdraw the appropriate sums even during idle periods. And if straight piecework were introduced, who would be left to work?"

The solution to the problem of machine tool operators at the Kamyshin Crane Factory has not come cheaply to the state. Planned production costs were exceeded by 350,000 rubles last year. Amortization deductions of NC machine tools (which cost more than 1.2 million rubles), extravagant Aeroflot expenses, and overpaid workers lie at the heart of the increase like a heavy weight.

Both in the Kamyshin Party gorkom and the Minstroydormash, A. Pochitalin is considered to be an energetic, modern leader, champion of technical progress. Yet has it occurred to no one to ask what the state has obtained in return for the new equipment given to the factory? Since it evidently has not, it is no surprise that this problem is not causing any headaches at the plant.

"Three-quarters of all machining work is not accomplished with NC machine tools. Our primary task is the utilization of this equipment for the parts," states A. Pochitalin, formulating his most immediate goal.

A worthy goal, but one achieved by several ways. It can be achieved through the full utilization of the workload capacity of the machines, which would enable not only the stated goal to be achieved, but superfluous equipment to be sold, as well. Workers would receive full wages, and plant facilities would yield real profit as a result. This approach would benefit everyone, if it did not require that the plant workers improve intraplant planning and raise production organization to a higher level. It is hardly surprising that the director has preferred another, simpler and easier way of achieving his goal: "winning" from the ministry six more sophisticated machine tools, three of them of the "machine tool center" variety, costing by the way, 550,000 rubles. Here you may recall Koz'ma Prutkov's assertion that it is easier to bear unpleasantness at public expense.

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## METAL-CUTTING AND METAL-FORMING MACHINE TOOLS

### POOR QUALITY NC MILLING MACHINES CRITICIZED

Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 15 Aug 84 p 2

[Editorial: "Price of Bonus Diplomacy"]

[Text] Under this headline there was published on January 1984 critical correspondence by V. Stolyarov about the cause of the low quality of products of the L'vov Milling Machine Tools Plant. As V. Pokasyuk, chief of the "Soyuztyazhstankoprom" VPO [All-Union Production Association] says, the facts in the article are valid. By order of the minister, V. Abashkin, director of the plant received a severe reprimand and a reprimand was also given to V. Buchma, chief engineer. A brigade of the chief inspection on quality control visited the plant. A "Quality Day" was conducted at the plant according to the result of the check, in which measures were outlined for raising the quality of the machine tools of the L'vov Plant.

For 1984 the L'vov Plant was given the task of mastering series production of a more modern NC machine tool using a microprocessor instead of the previously produced machine tool whose shortcomings were pointed out in the article. The plant manufactured 159 of the new model machines.

In this year it is also planned to manufacture 10 new in principle L'vov machines according to drawings by the Ivanovsk Machine Tool Building Association [SPO]. Wide cooperation was organized for this purpose between the L'vov Plant and the SPO.

Twelve automated and high precision machine tools will be introduced this year at the plant to raise the standard of production.

Regrettably, the administration of the L'vov Plant itself, according to the opinion of the VPO management, still has not found a way to implement the developed measures rapidly. Inertia in thinking on the part of the technical and production services of the plant continues to show.

The "diagnosis" in the article of the reasons for the low productivity of the products is being confirmed also after half a year. Is it not time for the managers of the Ministry of Machine Tools and Tools to answer: who, properly, should stop the "inertial forces" at the L'vov enterprise? The editor's office also hopes that the L'vov obkom of the Ukrainian Communist Party will finally evaluate the situation at the plant.



## METAL-CUTTING AND METAL-WORKING MACHINE TOOLS

### BRIEFS

CZECH MACHINE TOOLS -- According to contracts signed by the "Tekhmashimport," "Stankoimport" and "Elektronorgtehnika: All-Union Foreign Trade Associations with the "Tekhnoeksport," "Stroyimport" and "Kovo" Czechoslovak Foreign Trade organizations, the following will be imported to the USSR from the ChSSR: three installations for hydraulic cleaning; three lathes for machining crankshafts 35 meters long for ocean-going ships; and the first large lot of computers. [Text] [Moscow EKONOMICHESKAYA GAZETA in Russian No 32, Jul 84 p 18] 2291

VERTICAL BORING MILL -- New NC vertical milling machine tools with automatic tool change were installed in the shop for machining large castings at the Jig-Boring Machine Tool Plant. The interoperation preparatory time was reduced. The labor-intensiveness of manufacturing was reduced to about 1/2.2 of the previous time. It is now possible for one worker to service 3 machine tools instead of 1. Labor productivity in these operations has doubled on the average. [Text] [Moscow MOSKOVSKAYA PRAVDA in Russian 10 Jul 84 p 1] 2291

CNC TURRET LATHE -- In the gear-cutting tool shop of the Tool plant NC semi-automatic lathes have been installed for machining large intermediate products for hobbing cutters. It is now possible to use modern metal-cutting tools to drill holes. Labor productivity increased 1.6-fold on the average. [Text] [Moscow MOSKOVSKAYA PRAVDA in Russian 10 Jul 84 p 1] 2291

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## OTHER METALWORKING EQUIPMENT

UDC 621.73:658.2.69

### IMPROVEMENTS ON NEW FORGE-PRESS NOTED

Moscow KUZNECHNO-SHTAMPOVOCHNOYE PROIZVODSTVO in Russian No 2, Feb 84 pp 34-35

[Article by V. I. Konukov, S. V. Siryachenko and L. A. Selyuminova:  
"Reequipment of Forge-Press Shop of the "New Kramatorsk Machinebuilding Plant  
Production Association"]

[Text] A large reserve in raising the effectiveness of the economic potential of the forge-press shop is the timely and regular renovation of equipment.

The shop is equipped with 7.5 and 10 meganewton steam-hydraulic presses, as well as 1, 2 and 3-ton forging hammers and other equipment for working hot and cold metals, the majority of which was installed in the thirties.

The presses and hammers were modernized partially and some technological improvements were made. Thus, the forging presses were equipped with mobile platforms, devices for delivering tools to the forging zone and for rapid removal and securing of the casing of the upper hammer block. Forging manipulators of proper lifting capacities were installed at the 7.5 and 10 meganewton presses and at 2 and 3-ton hammers. Heating furnaces and auxiliary and transportation operations were mechanized. As a result of these measures, the productivity of the forging machines increased 1.5 to 2-fold on the average.

In the 11th Five-Year Plan period, the forge-press shop faces great problems to increase the output of forgings further.

It does not appear possible to increase the output and improve the quality of the forgings only by improving the heating technology and the forging.

Existing forge presses with a steam-hydraulic drive are slow; they are difficult to automate and cannot manufacture intermediate products with minimal tolerances. The existing heating furnaces are not equipped to maintain the required heating mode automatically; therefore, it is difficult to provide uniform heating of cross sections of the intermediate products.

To increase the output of forgings and stampings, and raise their quality, it is necessary to reequip the existing forge-press shop comprehensively.

Shop reequipment is directed toward raising the technical standards of individual production sections and machines by introducing new equipment and technology, mechanization and the automation of production processes and replacement of outdated equipment by new equipment, improving the organization and structure of production, as well as implementing other organizational and technical measures to increase output, improve quality, raise the productivity of labor and improve working conditions.

The reequipment of the forge-press shop is being done according to the plan of technical development. It is planned to create a high priority complex of specialized sections with maximally mechanized manual and transportation work, and replacing equipment. The entire reequipment plan is divided into several stages in the 12th Five-Year Plan period.

In the first stage, it is planned to create a heat treatment section for springs and a comprehensive-stamping section using 3.15-ton model M-2145 hammer.

The spring heat treatment section was located in the middle of a bay. The springs were hardened in a gas chamber furnace with following cooling in an oil vat, while loading and unloading from the furnace and vat were done manually. Oil vapors were emitted directly into the air of the shop and the temperature was not monitored.

The created heat treatment section was moved to the end of the shop. Heating is done in model SNO-8/16.5 electrical heating furnaces; loading and unloading are done by a floor-type manipulator; temperature is monitored by thermocouples and is maintained by a potentiometer, and the furnaces are equipped with exhaust ventilation. The section is 90 percent mechanized.

A comprehensive-stamping section is now located on the areas previously occupied by the heat treatment section. It consists of a model M-2145 3.15 ton hammer; a 31.5 kilonewton model K-2535 crankshaft trimming press; a model ScPK (GDR) 8 meganewton press-shears; and chain and roller conveyors. To expand the list of products, it is planned to install a continuous heating furnace for preliminary heating of blooms to 500-600°C before being cut on the press-shears, as well as to equip the section with a device to install and remove dies, containers and shelving for storage.

The die design incorporates rapidly removable inserts which makes it possible to reduce the labor-intensiveness of packets by 40 to 60 percent as compared to the usual design. The packets are changed in 1.5 to 2 minutes without removing the block from the press.

At the second stage, it is planned to rebuild the press bay by installing 12.5 and 8.5 meganewton hydraulic forge presses with 5-ton manipulators to replace the 10 and 7.5 meganewton steam hydraulic presses; build a new pumping station, install a 5-ton charging machine instead of a 3-ton machine; build a heating furnace with a pull-out bottom, etc.

The efficient arrangement of shop sections, their reequipment and the mechanization of the technological processes made it possible to reduce the labor-intensiveness of manufacturing; raise quality; reduce tolerances for machining; increase the output of stampings by 400 tons per year and save 28,000 rubles per year.

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## OTHER METALWORKING EQUIPMENT

### COMPUTER-CONTROLLED PLASMA CUTTER TRIPLES PRODUCTIVITY

Leningrad LENINGRADSKAYA PRAVDA in Russian 7 Aug 84 p 1

[Article by Ya. Strugach: "Plasma Cutters ... In White Smocks"]

[Text] Vyborg Shipbuilding Plant workers who have already cut metal with the "Kristall" plasma machine for some years, can now do these operations in white smocks. A clean bright room became their working place where a computer simultaneously controls six plasma cutters located in the shop.

This significant transformation was due to a group of specialists from the "Ritm" Association who several days ago placed in operation a typical module of flexible automated production to manufacture planar parts of ship hulls. In early June, we reported that the laboratory of the association successfully tested this module which included only two plasma cutters. But even then, it became clear that it was possible for a computer to control a large number of machines. Now, it has not only been confirmed here, but also implemented under production conditions.

A brigade of scientists, specialists and skilled workers of the "Ritm" Association installed in one of the shops of the Vyborg Shipbuilding Plant, on a very tight schedule, the necessary equipment, delivering a significant part of it from Leningrad. It was necessary to repair several plasma cutting machines, tune up a new type "Granat" machine, train gas-cutters to service the computer and the entire automated module as a whole. "Ritm" specialists from the shop worked late into the night trying to adjust the equipment fully in a short time and thereby execute ahead of schedule one of the important points of the socialist obligations of the collective.

According to preliminary estimates, labor productivity of cutting will triple at the shop of the plant where this special design module is now in operation. Essentially, the work of six cutters can now be done by one under considerably improved working conditions. It is unnecessary for the workers to be near the plasma flame zone to observe the cutter of the machine and control it. That is done by an automatic system according to programs stored in the computer memory.

Yu. S. Titkov, leader of the comprehensive brigade described the just completed work as follows:

"We consider what was done only one of the stages on the path of full automation of the section. It is significant that all equipment in the module is domestic. Its basic part is made by enterprises of the country in series production. Particularly such is the electronic control system made by the "Leningrad Electromedhanical Plant" Association, made specially for this module. The All-Union Scientific Research Institute of Electrical Meters in Leningrad produced the system for coupling the "Iskra" computer to the "LEMZ," so-called interface. Now, it can be considered series produced."

We are now talking about creating transportation systems that will free people from a number of auxiliary operations related to delivering metal sheets, moving already cut intermediate products, etc. This is not too far away and by the end of this year, four transportation lines and six plasma cutters, controlled by computers will do all the work previously done by workers. This will be the first typical production section in the country for manufacturing ship parts of a very large product list.

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## OTHER METALWORKING EQUIPMENT

### GOMSEL'MASH FORGE-PRESS MODELS, APPLICATIONS VIEWED

Moscow KUZNECHNO-SHTAMPOVOCHNOYE PROIZVODSTVO in Russian No 3, Mar 84 pp 2-4

[Article by N. I. Afanas'yev, general director, PO Gomsel'mash [Gomel Agricultural Machinery Production Association]: "Forge-Press Operations at PO Gomsel'mash"]

[Text] The Gomsel'mash Production Association is one of the largest enterprises for the production of animal husbandry and feed production equipment.

The association faces important tasks in producing KSK-100 and KSK-100A-1 forage harvester combines, KPKU-75 standardized towed combines, PSE-20 special storage facilities and other items. Their solution is possible only through improved technological standards for production, the introduction of progressive technological processes and equipment. These are the goals of the CPSU Central Committee and USSR Council of Ministers Decree: "On Measures for Further Improvements in the Technical Standards, Quality and Use of Machinery and Equipment for Agriculture and Increases in its Production and Delivery During 1983 - 1990."

This demanded a radical modernization of all manufacturing steps, first of all forge-press operations. These predominate at our enterprise, as forage combines use up to 1,000 cold stamped parts, while forged pieces are used as blanks for hundreds of parts. In the main plant alone there are five shops: press-billet, press, forge-press, forge and metal waste recovery which manufacture parts by pressure methods. Also, the association has other shops, for example, the hardware shop at the casting plant and the normal shop, which makes the basic production equipment: automatic presses for cold upsetting of bolts, nuts and other parts.

Until quite recently, cold and hot stamping operations were poorly mechanized and die designs did not make sufficient use of new progressive decisions. Therefore, an extensive program was worked out to improve the technical standards of cold and hot stamping. It was successfully implemented during the main plant's reconstruction. Its main goals were: production automation and mechanization, the reduction of manual labor, sharp reductions in the labor intensiveness of forge-press work, reductions in the metal intensiveness of parts obtained from cast and graded materials.

The technical standards of cold stamping operations are being improved through better technology and the introduction of new progressive equipment. It is

planned to automate and mechanize almost all press equipment. Design took into consideration the experiences of VAZ [Volga Motor Vehicle Plant], KamAZ [Kama AZ] and other progressive enterprises in the country. The Rostov Scientific Research Institute for Machine Building Technology, its Rovenki affiliate and a number of other organizations with which the association has contractual obligations actively participated in this work. Also, one should note that a considerable amount of work was done by the chief technologist and chief metallurgist at the association. They have capable and qualified collectives of technologists and designers able to solve problems at quite high contemporary standards.

The basis of press operations is the use of metal coils instead of sheet metal and the creation of comprehensive equipment for the mechanization and automation of cutting, fabrication and stamping operations. The cutting and stamping of parts from steel coils on automatic complexes improves the quality of finished parts and the strength of tools. It also eliminates interoperation transport and saves metal. The introduction of a single automatic line for the transverse cutting of steel coils saved 600 tons of sheet metal annually and had an economic effect of 137,000 rubles.

Presently in operation are: three automatic lines for the lengthwise cutting of coils, two of which can cut metal up to 2.5 mm thick and one up to 4 mm thick; 1 automatic line for the transverse cutting of coil steel up to 4 mm thick; 6 mechanized complexes for cutting sheet steel up to 20 mm thick based on series produced domestic and imported guillotine knives, one of which is intended to support free cutting of thick sheets up to 80 meters long from strip blanks and cards [karty]. Four automatic complexes for stamping large dimension, narrow and long parts based on four crank presses are in the set-up stage. It is planned to introduce 7 automated complexes for stamping average size parts from coils on 1 and 2 crank presses of up to 5 MN.

Twenty and 12.5 MN presses are to be equipped with feed mechanisms for thick sheet large dimension parts. Three units for stamping average size parts are being attached to single crank presses to feed thick cut strips. It is proposed to introduce mechanized lines for stamping average size heavy parts on 16 MN presses (Model K2542).

A mechanized line for trailer wheel disk stamping, consisting of a single Model K2540 (10 MN) press and three Model PKZ800 (8 MN) presses equipped with pan kickers and conveyors for moving parts from press to press is now successfully operating in the press and blank preparation shop.

Small parts are made by 4 automatic complexes for stamping from strips using 1 MN presses, 3 automatic stamping complexes using 630 kN presses, an automatic complex for stamping narrow and long parts from strips using a K3132A (1.6 MN) two crank press. Two presses (6.3 and 1.6 MN) for precision cutting have been installed. A 6.3 MN press has been equipped with devices for loading separate blanks. It is intended for large parts, making it possible to eliminate mechanical working.

The design proposes automatic complexes for roll forming based on K2330 and K3132 presses. One of them, for making collector rollers, has already been



introduced. Twelve tons of metal are saved annually. Technology for roll forming parts with complex shapes -- cutter drum beaters and reel plates -- is being worked out on two other complexes.

Improving the metal use factor (MUF) is one of the most important tasks in cold stamping operations. The introduction of technology for cold rolling augers from bands on a machine designed by NPO NIItraktorosei'khoz mash [Scientific PO and Scientific Research Institute for Tractor and Agricultural Machinery] is an example of an effective measure to improve the MUF. This will double the MUF and save 72 kg of steel per KSK-100 combine. The introduction of cold rolled augers will simultaneously reduce the labor intensiveness of their assembly and welding and will considerably improve their quality.

The association's technological services are organizing robotized complexes based on YeRI-125 (1.25 MN) open presses and PKZ250 (2.5 MN) closed presses. The main manufacturing operations at robotized complexes will be forming and moulding. Individual operations are already under way in the press and blank preparation shop.

The basic mechanization and automation of cold stamping operations should be completed in 1985. A total of 27 automatic complexes and presses for stamping coil metal and bands and 4 automatic cutting lines will be introduced. This will save 3-5 percent of sheet metal used. While cold stamping operations are now 73 percent mechanized, by the beginning of the next five-year plan this should rise to a planned figure of 83 percent.

In order to further develop and improve cold stamping operations, the association proposes the expanded use of progressive metal saving technology, the creation and introduction of new equipment designs with improved parameters for part cutting and stamping, mechanized complexes and industrial robots for stamping parts and the development of robotized sections.

To accelerate and improve the design of progressive manufacturing processes and toolings, work is under way and will continue on the introduction of computer assisted automated design of cold stamping and stamp toolings and on optimizing blank layouts.

Considerable metal savings (around 20-25 percent compared to existing technology) is planned through the introduction of progressive processes for manufacturing fasteners and hydraulic fittings by die forging instead of cutting.

The production of forgings by the association increased by 70 percent during the 10th Five-Year Plan and reached 25,700 tons in 1982. Hot stamped blanks produced by precision die forging will be implemented through the introduction of closed die, low waste stamping and hot stamping using extrusion and upsetting on crank hot stamping presses, radial stamping and hot rolling sprockets to transmissions, etc.

This was considerably helped by the introduction of a modern forge shop with all the essential progressive equipment. This shop has 19 mechanized hot

stamping lines. It was possible to introduce the brigade organization of labor because of the arrangement of equipment on the line: heater, stamps, cutter.

The association introduced Belorussia's first system for rolling gear teeth to chain transmissions instead of cutting, on a Model SNZ-2M designed by RostNIITM [Rostov NII for Machine Building Technology]. The blanks are thinner than the gear toothing. The hot rolling of nine types of chain gears has not been mastered. Metal savings from the introduction of 7 types of chain sprockets on KSK-100 combines were 17 kg per machine. In addition to metal savings, rolling has improved tooth dynamic strength and reduced abrasive wear.

The association has introduced radial stamping of teeth on gears with a small number of teeth. The manufacturing technology proposes the precision cutting of gears on a bushing [vtulochniy] stamp, the induction heating of blanks prior to die forging, closed die stamping on a K8544 press, scale removal, hot coining, mechanical working of outer diameters, radial stamping with TVCh [High frequency current] heating, radial stamping with simultaneous gear teeth hardening, tempering and mechanical working of openings.

The introduction of this technology will permit up to a 35 percent metal savings and simultaneously strengthen gear teeth. In 1983 the introduction of radial stamping of two types of sprockets saved 39 tons of metal. It should be noted that radial stamping can be used on sprockets working at low rim speeds (up to 3 m/sec).

In the manufacture of sprockets using stamps with detachable dies without subsequent mechanical working of the toothing, metal from the center is drawn out towards the periphery, where the teeth are formed by a tooth die. Stamping with detachable dies saves 40 percent of the metal and labor intensiveness is reduced by 45 percent compared to gear teeth cutting.

In recent years the association has further developed progressive technological processes for precision hot die forging. These include: stamping on crank hot presses with low oxidizing heating, hot and semi-hot extruding, blank upsetting on horizontal upset forging machines, stamping and roll forming on up upset rollers, stamping with coining and calibration, the manufacture of stepped shafts on transverse-skew rollers, radial stamping and hot rolling of chain sprockets, joint stamping on a KGShP [crank hot stamp press] and ring hammers in the forging plane, etc.

The assortment of rolled sprockets will be expanded. Jointly with RostNIITM we are mastering the rolling of chain sprockets with diameters more than 440 mm. An economic effect of 61,900 rubles is expected from the introduction of combined stamping of circular parts in the forging plane on hammers and KGShP. This will be done jointly with the Rovenki affiliate.

This year the association acquired an OWQ-100 transverse-skew roller from the "Erfurt" firm (GDR). This can roll blanks for multi-stepped shafts up to 100 mm in diameter and 630 mm long. The machine's operation will considerably improve the MUF and save up to 300 tons of metal annually.

During the 12th Five-Year Plan it is intended to introduce a process for extruding blanks on a 5 + + 5 MN double action press with detachable dies. This will simplify press tool design and save metal through the manufacture of more accurate press tools with reduced forging tolerances. It will also reduce the amount of mechanical working.

Nine forge induction heaters, including 2 with thyristor convertors are now used to heat blanks. Their number will be increased to 17 units and the number of blanks obtained with the use of low oxidizing heating will increase 3-4 fold.

A shop for producing 16 million cutting bar fingers annually is being built at the casting and normal plant. It will supply these parts to the entire animal husbandry and feed production machine building sector. The shop's hot stamping equipment is an automatic line based on a Model LZK-315 press produced in Czechoslovakia. Two automatic lines producing 2 million fingers annually each are being installed. They should reach their planned capacity in 1986.

I would like to dwell on some problems which are delaying the development of forge-press operations. One of the most important is that of supplying them with means of mechanization, including automatic manipulators. If the plants manufacturing presses are in no condition to supply them on all the equipment they produce, then they must be made on order.

Equipment should meet safety requirements. When presses are modernized there should be no changes in their specifications: closed height and openings for air blowers as this makes it necessary to rebuild fittings. The same model presses now sometimes have quite different specifications.

A new approach is essential to the manufacture of 1.6 and 2.5 MN edge bending presses. Machine builders are experiencing an acute shortage of them. It is also essential to centrally manufacture a series of standardized gas heaters with devices for using secondary energy sources (recuperators) etc.

There is still an acute problem of uninterrupted supply of coiled sheet metal more than 2 mm thick, coils weighing up to 10 tons, coiled bands 3.6 mm thick and 150 mm wide for augers. Measures guaranting considerable metal savings are often not introduced or delayed because of long delays in reordering hot rolled for cold drawn small shapes and difficulties in obtaining special profiles. These problems are not new, but slow decisions delay progress in forge-press operations.

The realization of plans to reequip forge-press operations and improve technical standards will permit the association to more successfully handle the tasks posed by the CPSU Central Committee and USSR Council of Ministers Decree: "On Measures for Further Improvements in the Technical Standards, Quality and Use of Machinery and Equipment for Agriculture and Increases in its Production and Delivery During 1983 - 1990."

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## AUTOMATED LINES AND AGGREGATED MACHINING SYSTEMS

### KIRGHIZ MACHINE TOOL INDUSTRY GEARS UP FOR FMS

Frunze SOVETSKAYA KIRGIZIYA in Russian 30 Sep 84 p 2

[Article by V. Kravtsov, docent, Frunze Polytechnical Institute: "Flexible Automated Production Helps to Raise Machine Quality"]

[Text] Ten shops and 17 sections are to be fully mechanized and automated and 10 flexible automated production operations are to be placed into operation in the republic's industry prior to 1986.

Flexible automated production makes it possible to retool quickly to produce new models, and at minimum labor and material outlays for that matter. One of its advantages is that articles can be produced without introducing special gear. In the Kirghiz SSR, where machine building is one of the leading sectors of the national economy, creation of flexible automated production is an extremely important problem. The first and necessary stage on the road to organizing flexible automated production must be creation of a group production operation. We must begin this work by rejecting the traditional specialization of shops in relation to specific machine tools, such that each shop manufactures the most diverse parts, and instead specializing them in relation to specific parts. Experience shows that the advantages of such a change are indisputable: The coefficient of equipment use rises, the qualifications and specialization of the workers increase, and as a consequence their labor productivity grows.

The next step is to develop quickly adjustable mechanized attachments for positioning parts on machine tools, automate auxiliary processes and write computer programs for processing parts of moderate complexity. Incidentally one work shift would be enough to draw up the programs. And the impact of using such programs is substantial: The production cycle decreases tenfold, and even a hundredfold, and production becomes more maneuverable.

Work is already being conducted in this direction at six of the republic's enterprises, including at electronic computer plants, at the Kirgizelektrodvigatel' Plant and at the Agricultural Machine Building Plant imeni M. V. Frunze.

Thus the Agricultural Machine Building Plant imeni M. V. Frunze has created a robot-equipped sheet stamping section, freeing the individual from monotonous and heavy operations. Production effectiveness has become higher here than

before robots were introduced, but not all possibilities have been utilized fully. The fact is that four flexible robot-equipped modules process only about 10 parts using a 32,000-part press production program. This is of course low. What also decreases effectiveness is that blanks are still being positioned by hand. The plant workers understand this, and they are planning to start up another four robot-equipped presses and raise the number of parts machined in the section to 45-50. There are also plans for creating an automated blanks warehouse and developing a system for automatically positioning them in storage units and feeding them to the work stations.

Although the experience the republic has accumulated in using modules is not very great, it does deserve dissemination. A module can operate on the basis of a prescribed program without human intervention, as long as blanks are present in the storage unit and free places are available for finished parts, as long as the tools maintain their cutting qualities and as long as the necessary accuracy does not drop below tolerance--that is, for about one work shift. This is very important to raising the effectiveness of the third shift. The productivity of people working at night falls, while a module that works without a human operator can produce at a given rhythm at any time of the day.

The economic impact can be raised significantly by attaching automated blanks and finished products warehouses and robot-equipped transport systems to several such modules controlled by a single computer--that is, by creating a flexible production complex. The equipment load coefficient approaches unity in such complexes. Part machining time is decreased by a factor of 2-3 in comparison with traditional production, the number of required machine tools with digital programmed control decreases by the same amount, production cost drops by 3 to 5 times, and production space is saved. Possessing production complexes controlled by a single computer, we can organize flexible automated production. All elements of the production process must be automated, beginning with planning the technical documents and the control programs for the principal articles and the production gear, and ending with warehouses for blanks and finished products, and the production gear itself.

The work of creating flexible automated production operations of course requires both time and effort, but all outlays are quickly compensated. Machine tool production becomes capable of fast adjustment for production of new models, and less manpower is required. The functions performed by people are decreased significantly, but the most important jobs are retained by them--adjusting the production system, automated control of production and solution of the long-range problems associated with its improvement, all of which requires a higher and secondary technical education.

A real impact is enjoyed from creating flexible automated production by those enterprises at which it is organized at the scale of sections, shops and, still better, plants, and accompanied by improvements in production processes.

Unfortunately this circumstance is often ignored. Robot-equipped modules are scattered individually among different sections and shops. And so, expensive and highly productive equipment finishes the volume of work available to it

at the given section within 2-3 hours, after which it sits idle for the rest of the time. I think that there is no need to mention the names of the enterprises at which this situation is encountered. Many of them are still stricken by this problem today.

Production of machines which are highly productive and dependable and which satisfy the requirements of technical progress is a difficult and laborious process. Flexible automated production is making it possible to transfer to machines a significant share of the operations associated with their manufacture. The faster this is done, the better it will be for the national economy.

11004

CSO: 1823/105

## AUTOMATED LINES AND AGGREGATED MACHINING SYSTEMS

### NEW AUTOMATED LINE FOR COMBINE PLANT

Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 20 May 84 p 1

[Article by V. Baybik: "For the Makers of the 'Don'"]

[Text] The collective of the Krasnodar Machine Tool Association imeni M. I. Kalinin has accomplished the on-time delivery of the first automated line for machining parts for the "Don-1500" combine to the Taganrog Combine Plant.

It would seem that the production of automated lines would have become a commonplace matter for the machine tool builders of this association: more than 200 lines produced in Krasnodar are operating at the VAZ, the KamAZ, the Kuttaisk Motor Vehicle Plant, and at many other enterprises of the nation. Nonetheless, the production of the "LKMV-325" marks a new stage in the collective's work.

"The honor of participating in the realization of the Food Program fell upon our association," says general director of the association M. Kholdyrev. "We, along with other enterprises of the machine tool and tool industry, were given the assignment of producing the requisite manufacturing equipment for the production of the 'Don' combines and other grain harvesting machinery."

And now the authoritative commission from the Taganrog Combine Plant has accepted delivery of the first line for machining the intermediate shaft of the "Don-1500" transmission. It will comprise the beginning of an automatic line complex. It utilizes a new transport system, cutting tool with wear-proof coating, and monitoring and measuring equipment that detect breakage of the tool in all of the machining operations. The implementation of the line entails an economic effect of 157,000 rubles. And in the future, when the entire complex is put into operation, this effect will increase to 1.2 million rubles per year. The complex will replace 13 workers on a shift.

"The labor of collectives representing many enterprises has been invested in this line," emphasized party committee secretary L. Mezentsev, "including those of other socialist friendship nations. For instance, the self-contained equipment--the metal-cutting machine tools, gantry transfer arms, and transport system, were produced in the People's Republic of Bulgaria."

The association imeni Kalinin is responsible for the production of 42 automated lines for machining parts for the "Don" combine alone, including 29 lines for the Taganrog Combine Plant. The experience of the collaboration of designers and plant workers has proven to be invaluable in the stepped-up work schedule. Colleagues of the Special Design Bureau for Automated Lines and Metal Cutting Machine Tools A. Gakh, V. Suslin, A. Onishchenko, V. Timokhin, V. Khazizov, and many others have been of great help in the adjustment of the lines.

A socialist competition for the on-time manufacture of lines for the "Don" combine has developed in the plants of the association.

12678

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## ROBOTICS

### DEVELOPMENTS IN SOVIET ROBOT TECHNOLOGY VIEWED

Moscow STROITEL'NYYE I DOROZHNYYE MASHINY in Russian No 7, Jul 84 pp 2-3

[Article by Engineer V. B. Alekseyev (VPO Soyuzstroymashavtomatizatsiya [All-Union Industrial Association for Mechanizing and Automating Production Operations of USSR Minstroydormash] and L. M. Rudskiy (TsNIITEstroy mash [Central Scientific-Research Institute for Information and Technical and Economic Research for Construction, Road and Municipal Machinebuilding]): "On the Results of the Specialists' Seminar"]

[Text] A seminar, "Experience in Creating and Organizing the Production and Introduction of Industrial Robots and Robotics Operating Complexes at Minstroydormash [Ministry of Construction, Road and Municipal Machine Building] Enterprises," convened in Moscow at VDNKh SSSR [USSR Exhibition of National Economic Achievements]. Chief manufacturing engineers, chief designers, section chiefs, sector managers, and engineers and specialists of All-Union industrial and science-and-production associations, enterprises and institutes of Minstroydormash, as well as representatives of plants, scientific-research institutes and design bureaus of Minelektrotekhprom [Ministry of Electrical-Equipment Industry] and other ministries, organizations and agencies, took part in the seminar.

The seminar's purpose was to point out the newest scientific, technical and industrial achievements in creating and introducing robots and roboticized complexes and to exchange experience gained. Also discussed were tasks of further reducing manual labor and of freeing workers employed in heavy and monotonous operations.

The seminar's participants noted that a speedup of scientific and technical progress and conversion of the industry's economic base to intensive development is unthinkable without large-scale use of highly effective systems of machines and operations that will support the integrated mechanization and automation of machinebuilding work and the reequipping thereof.

Major attention is being devoted to such most important areas of scientific and technical progress as integrated mechanization and automation of production, heavy use of industrial robots, the introduction of flexible automated systems, the wide use of electronic equipment and the use of new structural materials.

The basic task that faces specialists of the industry's enterprises and institutes, along with reducing the time taken to create and master facilities that produce new machinery and equipment, is that of improving production technology. Because of this, the need to mechanize and automate small-series production is becoming increasingly more important. Enterprises should provide for increased production effectiveness by introducing automated production systems, improving the use of equipment, and achieving more flexible control. This will enable production work to be rapidly restructured in accordance with changing tasks.

During the first 3 years of the 11th Five-Year Plan, 105 program-controlled robots, 141 balancing robots and 36 automatic operators for galvanic departments, which are being used basically within robotics complexes and lines, were introduced. About 1 million rubles have been saved, thanks alone to the introduction of robots in basic production. For the first time in the industry, a robotics complex for arc welding was introduced at the Krasnyy Ekskavator Production Association. It is planned to turn over for operation robotized sections for the mechanical machining of parts at the Kalinin Excavator Plant, for stamping at the Liftmash Production Association, and for painting at the Vyksa Crushing and Grinding Equipment Plant.

In 1983 the industry reduced the proportion of workers engaged in manual labor and provisionally released 2,510 persons. In 1984, 3,260 more workers are to be released.

In carrying out the OTsKP [not further identified], "Technical Reequipping of the Industry," the institutes are working to create standardized robotics complexes for groups of equipment that are not included in the prime ministries' programs and standardized members for transporting-and-stacking and orienting devices for the creation of production facilities that will have integrated mechanization and automation. Under development is a subprogram that runs up to 1990, which calls for the creation, jointly with the country's leading ministries, of a number of flexible production systems for machining body-of-revolution type parts and framework parts. Scientific and technical collaboration with enterprises of VPO Soyuztochstankoprom [All-Union Association for the Production of Precision Machine Tools] of USSR Minstankoprom [Ministry of Machine Tool and Tool Building Industry] will enable two modern flexible automated production facilities for machining framework members under an unmanned-technology principle to be created at the start of the 12th Five-Year Plan.

During the current five-year plan, the newest achievements of science and technology are to be introduced and progressive technological processes and equipment are to be mastered more rapidly at Minstroydormash plants.

The industry's VKTIstroydormash [All-Union Design and Technological Institute for Construction, Road and Municipal Machinebuilding] performed a number of operations to determine the possibility of using robotics complexes for arc welding (RTK DS), and design work has started on auxiliary equipment for standard RTK DS's, which includes a two-place positioner with a load-handling capacity of 150 kg, a cantilever robot with a load-handling capacity of 500 kg, a horizontal rotator robot with lifting centers, a multiple-position universal positioner with a load-handling capacity of 250 kg, and servicing devices and a programing unit. Six kinds of RTK's for welding items that weigh up to 1,000 kg and whose dimensions run up to 3 meters can be completely outfitted from the set of equipment being designed. This equipment can be used with the basic types of robots with a contour control system.

The institute has also done work on use of the Brig-10 ZAZ industrial robot for welding and for parts deposition. An RTK for deposition on pistons has been developed and introduced for the Kovrov Excavator Plant, and an RTK for welding and deposition has been developed for Alapayev's Stroydormash plant, Korosten's Oktyabr'skaya Kuznitsa road-machinery plant and Yaroslavl's Krasnyy Mayak plant.

The institute's staff workers are working jointly with Bulgarian scientists on the project, "The Development and Production of Models of Robotics Complexes and of Outfitting Items for Welding and Painting Operations," with a view to creating an RTK DS based upon the Bulgarian RB-251 industrial robot (PR) and an RTK for painting that is based upon the Bulgarian RB-210 type PR. RTK's are being developed for painting framework members and small-size articles.

Much work is being done to introduce flexible technology for the mechanical machining of holes in framework members, covers, flanges and hubs for construction and roadbuilding machinery during small-series production. A vertical semiautomatic unit with a magazine made up from eight multiple-spindle boring and thread-cutting heads (eight of them in all) and a four-position rotator for parts being machined has been produced on the basis of the institute's developments. The semiautomatic unit can machine groups of parts with automatic replacement of the multiple-spindle heads with rotation of the magazine, or 1-2 parts with use of the whole set of heads with appropriate rotation of the part in the rotator. One such semiautomatic unit is in operation at the Kurgan Road-Machinery Plant.

The collective of the NPO [Science and Production Association] VPKTIstroydormash [All-Union Design-Development and Technological Institute for Construction, Road and Municipal Machinebuilding] is doing work on the development and use of flexible production systems within the industry. The pool of numerical-control machine tools at Minstroydormash enterprises has now risen about 1.8-fold. The industry's plants are using 130 machine tools with responsive control systems based upon microprocessors and more than 40 multiple-purpose "machining center" type machine tools.

However, the utilization coefficient of numerical-control machine tools is still low.

At the Mogilev Elevator Plant, Kremenchug's Dormashina Production Association and Kiev's Stroydormash plant, numerical-control presses are being introduced. Continuity of production processes must be insured so that high-precision machine tools, semiautomatic units and robots are used fully. Integrated brigades for servicing and repairing them and for reducing above-norm nonproductive idle time should be created.

The utilization effectiveness of numerical-control machine tools, PR's and computers depends upon the time spent in and quality of preparation of control programs (UP's), especially for multiple-use "machining center" type machine tools, milling machines, boring machines, and so on.

An industrywide system for automating UP preparation for numerical-control equipment, including 35 models of machine tools for diverse operating purposes, has been created at some plants in accordance with the institute's developments. High effectiveness of the automated preparation of UP's for machine tools of the milling, boring and drilling groups has been proved. In order to create an optimal system for automating the programming of numerical-control lathes, a specialized subsystem for automating lathe-machining programming is being created in collaboration with the Kiev Institute for Automatics. It will be a component part of a united SAPR [automatic designing system] that

includes two Konstruktor (the Automatics Institute is the developer) subsystems and Tekhnolog numerical control (VPKTIstroydormash is the developer), which is used for machining body-of-revolution type parts.

The seminar's participants became acquainted with the work experience of NPO VPKTIstroydormash in the design and introduction of several types of robots for jet-type painting preparation and for painting inner tank-car surfaces. It was recognized as desirable that production of this equipment be increased. The annual economic benefit from using one robot alone is 15,000-25,000 rubles, and, moreover, the workers' labor is greatly facilitated.

The innovators of Nikolayev's Dormashina Plant imeni 50-Letiya Velikogo Oktyabrya, in considering the large mix of articles produced and the occasional small-series production thereof, decided to group parts in accordance with their operating attributes and to create rapidly resettable robotics complexes. A special group of inventors analyzed the parts being produced, in accordance with their operating and design-development attributes. For each part, a card was started that reflects the part's configuration, weight, material, annual output, materials utilization coefficient, and the equipment used. After an evaluation of these data, a decision is made to use a particular robotics complex or to create a specialized one. This, in turn, opened up a wide road for unifying the parts.

Among the first to be created was a complex based upon the MR-73 routing machine with hydraulic manipulator. At the plant an installation is being fabricated for the hot upsetting of "axis-with-clamp" type parts, the introduction of which will free several units of mechanical equipment and save a large amount of metal.

Technical means for transporting, storing, loading and unloading operations (PRTS) is being developed by the NPO of VITstroydormash [All-Union Institute of Construction and Road Machinebuilding Technology]. It is planned to create during the current five-year plan 323 warehouses, 5 of them mechanized, and to introduce about 200,000 product containers, 325 conveyors 1,000 electrical loaders, and 1,800 units of crane equipment. Taking steps to reequip enterprises with machinery will enable rises in the level of mechanization of PRTS operations for external and interdepartmental freight traffic to 88.7 percent and in the degree of mechanization of labor to 43.6 percent, and an economic benefit of more than 3.2 million rubles to be obtained. In addition, 2,500 people will be released provisionally.

With integrated solution of questions of transporting and storage that are associated with the basic operating process of manufacturing parts, among the more promising fields for automation is the use of automated transporting-and-storage systems (ATSS's) and transporting-and-stacking systems (ATNS's), which will enable work on lines and sections and in mechanical machining departments to be automated.

Experience indicates that roboticization of the workloads of mechanical machining equipment will increase 3-fold to 4-fold the yield of finished articles from a unit of equipment. High effectiveness of automation is achieved only when the means are used in unison. For example, GAP [not further identified] on the basis of a linking of roboticized complexes, storage facilities and computer equipment.

Representatives of the industry's scientific research institutes and science-and-production associations, the Kiev Institute of Electrical Welding imeni Ye. O. Paton, and VPTIelektro [All-Union Design-Development Institute for Electrical-Equipment Production Technology] and other organizations presented informative reports at the seminar.

The seminar's participants visited the VDNKh SSSR's permanently operating exposition that is dedicated to the use of robot equipment, the Moscow Machinebuilding Plant imeni Kalinin Production Association, and the Motor-Vehicle Plant imeni Likhachev.

The meeting adopted appropriate recommendations on the creation, organization of production and introduction of industrial robots and robotics complexes in the industry.

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11409

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## ROBOTICS

UDC 621.865.8

### SOVIET ROBOT EXHIBITION REVIEWED

Moscow MASHINOSTROITEL' in Russian No 7, Jul 84 pp 45-46

[Article by N. P. Oleynikova: "Parade of Robots"]

[Text] The "Industrial Robots and Robotized Industrial Complexes" exhibit, in the "Machinebuilding" pavilion of the USSR VDNKh, displays about 60 specimens of automatic manipulators and robots shown by organizations and enterprises of 16 ministries and departments. These specimens differ in purpose, specialization, kinematic criteria and basic parameters (lifting capacity, mobility, types of drives and control systems).

The "Brig-10-ZAZ" industrial robot, created by the Zaporozh'ye "Kommunar" Automobile Plant, makes it possible to automate loading-unloading when servicing basic technological and auxiliary equipment in mass, large series and series production. Its mechanical arm, controlled by a program selected on a plug panel, has five degrees of freedom, moves in the vertical and horizontal positions with speeds of 300 and 600 mm/sec respectively and lifts loads weighing up to 10kg.

The "MP-11" pneumatic industrial robot of modular design is being exhibited by the TsNIOKI [Central Scientific Research Cybernetics Institute] for robot equipment and technical cybernetics at the Leningrad Polytechnical Institute imeni M. I. Kalinin. Both its arms can be moved simultaneously or separately. One arm is equipped with a grip rotation device, while the other arm is equipped with a device for horizontal motion. Each arm has six degrees of mobility and can carry parts and tools weighing up to 1 kg. The robot services metal-cutting machine tools, presses and is used for assembly operations. Its use increases the productivity of labor by 40 percent and two persons are freed from monotonous, tiring labor.

The MP-12 robot cart was developed by Leningrad specialists and can service up to 60 objects. Its frame contains two baskets for boxes with parts which are loaded and unloaded by the mechanical arm. The route for the robot in the shop is "designated" by a belt conveyor, built under the floor.

The KM5Ts420 automatic manipulator with three arms was designed by the Voronezh ENIKmash [Experimental Scientific Research Institute of Forge-Press Machinebuilding]. It consists of an automatic manipulator with pneumatic drives for the actuators and a unit in which a cyclic program control device is installed.

The pneumatic drives make it possible for the grips to move horizontally and vertically with a speed of 1.5 and 0.4 m/sec respectively. Hydraulic shock absorbers provide smooth stops of the mechanical arms at the end positions. The robot is used to load single intermediate products into the loading space of 63 to 160 ton-force single-crank sheet stamping presses and other stamping equipment of the vertical type. Since the manipulator has to transfer intermediate products and articles of various configuration, it is equipped with pneumatic (vacuum), pneumatic-mechanical and electromagnetic grips.

Along with exhibiting industrial robots, talks are given on creating and introducing robotized technological complexes which are the "foundation" of robotizing shops and enterprises. Thus, the following are described: a turning machine tool-automatic manipulator set; a plating section; an L612A automated line for cold stamping of parts from single sheet intermediate products; an NC LAS-13 rapidly readjustable automatic line for machining shafts of various configurations for small series and series production.

According to the purpose of their use, robots are conditionally divided into auxiliary and basic. The robots indicated above are auxiliary because they work on the interoperation transfer of intermediate products, parts and articles with automatic loading and unloading of various equipment; transfer finished articles to the warehouse; and service technological and transport equipment.

It was also explained at the exhibit how the robots move. The MAK-1-50 manipulator for servicing shop conveyors, designed by the VNIIPtmash, was mounted on rails laid parallel to the conveyors. A special device equalizes the speed of the automatic manipulator with the speed of the cart in 6.3 seconds. During that time, the mechanical arm, capable of lifting a load weighing up to 50 kg, removes the hanger with parts from the hook and feeds it to a floor type storage conveyor, a technological equipment feeder or other types of transportation facilities, lays the parts in trays or packing boxes in a set order, placing liners between the articles. The mechanical arm is 1.2m long and moves toward the load with an error not greater than 3mm.

The hydraulic drives of all manipulator devices are started by an electrical unit installed on a trailer cart. A hydraulic distributor accelerates and brakes the MAK-1-50 manipulator, and holds it where needed. The MTsK-M43/3 computer is used to control the manipulator.

The "Elektronika" TsNII [Central Scientific Research Institute] created an automatic manipulator which moves on a monorail, carries loads weighing up to 63kg over passageways, thoroughfares or equipment without interfering with ground transportation. It may be used in all sectors of the national economy for transport between technological lines and warehouses, as well as between work positions which are far apart.

The NIAT [Scientific Research Institute of Aviation Technology] exhibited the MP-100 electromechanical loading manipulator. It lifts loads up to 100kg to a height of 1.5 meters. This manipulator can be secured to the floor, a wall, column and ceiling; it is moved in the shop on a wheel cart.



Technological robots do basic operations in foundry, forge-press, stamping, welding machining, painting and other production facilities. Among exhibits are specimens of technological robots.

For example, the model 111A NC automatic manipulator developed at the VPKI [expansion unknown] of the welding production facility of the Minstankoprom [Ministry of Machine Tool and Tool Industry] (Kiev) is designed for electrical arc welding in small series and series production. The model A711B09 automatic complex for pressure die casting was developed by specialists of the Tiraspol' Casting Machines Plant imeni S. M. Kirov. It includes three manipulators. The first manipulator scoops a portion of molten metal with a dipper and accurately fills the pressure mold. The accuracy of the metal dosage in the dipper is monitored by special sensors. The second manipulator cleans the mold and oils its inner surface. The third manipulator removes castings from the mold, lowers them into a vat with cooling liquids, feeds them to the trimming die and then carries them outside the working zone. The automatic line for assembling LAST-1 transformers may be called an assembly robot (productivity 300 transformers per hour). In accordance with a general program, a conveyor feeds transformer windings to the work position. Here two manipulators wait for them: the first one places the lower clamp of cores on the winding, while the second one places the upper clamps on the winding first lowering them on a pad with paste which hardens when finished transformers get into the drying chamber; at the exit of the chamber monitoring sensors measure the electrical characteristics of the product. The monitoring data is analyzed at an electronic control panel. On its instruction, the automatic manipulator removes a rejected transformer from the conveyor. These operations take 12 seconds.

The exhibit also demonstrated a forging complex with a hydraulic press program controlled manipulator, a robot for plasma cutting of complicated variable cross section shapes, an equipment complex for powder painting, an automatic manipulator for painting inner surfaces of cisterns, etc.

The Leningrad Mechanical Institute and the Leningrad Applied Mathematics Institute imeni M. V. Keldysh exhibited the STZ-2 system for robots with technical sight. Their main organ ("eyes") is a high speed laser for measuring distance. Robots, operating in pairs with horizontal, vertical, continuous and pulsing conveyors, will make use of "eyes," designed in the Siberian Physio-Technical Institute imeni V. D. Kuznetsov. The sight correlation system created by the Tomsk scientists for industrial robots has high precision, reliability, is interference resistance and has a low cost. Its principle of operation is based on the correlation-extremal method for comparing two images of parts: current and reference.

The LPI-2M model of a universal sensitized robot, a representative of the second generation of robots, is designed for interaction between robot and operator, as well as other robots and equipment. It has two mechanical arms. One of them is sensitized and is equipped with ultrasonic sensors which make it possible for the arm to slide above the conveyor belt at the necessary level, the arm of the robot is aimed at the target and the distance to the object which must be gripped is measured; then the robot is aided in removing the object from the conveyor. The grip design provides careful handling of fragile articles. The



robot arm wrist is made of rubber, corrugated on the outside and its fingers bend smoothly and softly.

The LPI-2M is an example of a modular principle for making robots which consists of series production of its individual structural parts in the form of a typical series of standard modules with various operating characteristics. The modules make it possible to assemble robots of the required complexity to implement specific operations. Investigations have shown that practically for all basic applications, robots and manipulators may be combined using about 10 pneumatic, 15 electromechanical and 20 hydraulic modules. This reduces schedules for designing and organizing production from 2 to 3 years to several months. Robots are becoming more perfect and reliable because they are assembled with well-debugged series produced components, and the cost of their manufacture is reduced.

An entire series of modular type robots may be seen at the exhibit. Among them, robots with a lifting power of 10 kg with a pneumatic drive. A set of modules makes it possible to assemble up to 20 versions depending upon the purpose for which they are to be used -- unloading and loading dies, presses, welding devices, heating furnaces, pressure casting machines, NC machine tools, etc. Four machine tool-robot sets with the universal robot were developed for the Leningrad Pneumatic Machine Plant and 12 sets for the Kopecysk Machinebuilding Plant imeni S. M. Kirov. The robot was designed by the VNIIPTuglemash [All-Union Scientific Research and Design Technological Institute of Coal Machinebuilding] .

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## ROBOTICS

### EFFECTS OF ROBOTIZATION AT SARANSK PLANT VIEWED

Moscow PRAVDA in Russian 27 Aug 84 p 1

[Article by PRAVDA stringer A. Shirayev: "A Second Profession"]

[Text] Though the shops of the Saransk Instrument Making Plant imeni the 60th Anniversary of the USSR are filled with the usual sounds of work, nowadays there are hardly any people in them. Since the start of the current five-year plan the enterprise has installed 100 robots which freed scores of production workers from manual toil.

In addition, mechanization and automation of production leads to increased output.

Many details are produced by presses equipped with robots. Thus, they perform 95 percent of the operations on the assembly line for internal combustion engine filter dirt indicators; four galvanization lines likewise function to pre-set programs.

To accelerate the assimilation of progressive technology the plant organized a design and technology bureau of robotization which drew into its fold the most creative-minded engineers and workers. The fact is that every five-seven years the plant's output must be renewed in toto, and robots are simply ideal for that purpose. All you have to do is replace their sensors, cassettes and some other elements and presto, they are ready to start making new parts. Many such replaceable fittings have already been developed by designer mechanics A.Titov and V.Tarasova and electronics designer engineers V.Nikulin, S.Yermak and others.

The creative engineering groups have also found ways to improve the serial manipulators arriving at the plant. For example, the "one-armed" robot MP-9S was equipped with additional accessories and "taught" to do three operations instead of one. Another creative group proposed an original unit which allows the manipulator to turn out 35 different parts. And it takes only 5-7 minutes to readjust it for a new assignment. One of the robots was perfected

by workers A.Pronin and A.Ushakov who thereby freed their comrades from a simple but very monotonous manual operation.

At the present time entire robot complexes are created in the shops. Six such complexes are operational in the section that makes membranes for medical instruments. They can produce up to a million units a year, several times more than previously.

The robotization process forced practically every one of the plant's subdivisions to improve performance. The tool and dye makers, for example, must now produce only high-quality rigging. Much stricter are the demands placed on the dimensions of the workpiece - if the tolerance is too liberal, the automaton will simply refuse to handle it.

From modernizing serial robots the plant has progressed to building its own manipulators which, by the way, turn out less costly. Over ten such mechanisms are already operational, twenty are undergoing trials at the plant's testing range and some have been shipped to client enterprises in various cities in Ulyanovsk oblast, our autonomous republic and the Azerbaydzhan SSR. It can well be said that the Saransk plant has mastered a second profession - robot building.

12258

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## ROBOTICS

### SHORTAGE OF ROBOTS IN NON-MACHINEBUILDING SECTOR DENIED

Moscow EKONOMICHESKAYA GAZETA in Russian No 34, Aug 84 p 8

[Article by L.Snovskiy, chief, Machine Tool Building Department, Gosplan SSSR: "Top Priority to Robotization"]

[Text] I read with interest the article by Riga plant director Yu.Ya.Kokt "At the Heart of Robotics" published in this year's first issue of EKONOMICHESKAYA GAZETA. In my opinion, the author brought up a number of urgent problems facing the development of Soviet robotics.

Indeed, at the present time the overwhelming majority of industrial robots are used in the production processes of machinebuilding and metalworking. In addition to the reasons cited by the author of the article, this phenomenon stems from the fact that the machinebuilding industries lack the required number of specialists in robot-based automation of production. As a result, potential customers in the non-machinebuilding industries of the national economy are, as it were, isolated from the process of broad robotization, whether the robots in question are of the general machinebuilding type or special purpose models.

One must disagree with the author's contention that a number of potential buyers have no way of ordering the industrial robots they need. Firstly, the well-known decree of the CPSU CC and USSR Council of Ministers "On expanding production and incorporation into the national economy of program-regulated automatic manipulators (industrial robots) in 1981-1985" pinpoints the ministries responsible for the creation, production assimilation and incorporation into the economy of industrial robots and robot-based machine complexes. The task of providing these services to the non-machinebuilding industries, for instance, has been assigned to the following ministries: Machine Building for Light and Food Industry and Household Appliances, Chemical and Petroleum Machine Building, Tractor and Agricultural Machine Building, Machine Building for Animal Husbandry and Fodder Production and others. It is their job to develop robots according to their specialization as these are ordered by other USSR ministries and departments.

Secondly, the procedural guidelines for ordering industrial robots were set forth on December 21, 1982 in a joint decree by the State Planning Committee and the State Committee for Material and Technical Supply "On planning the production, distribution and delivery of program-controlled automatic manipulators (industrial robots).

As for the methodology for determining the economic benefits of robotization, this year saw the introduction of country-wide "Directions for evaluating the economic effectiveness of the development and utilization of program-controlled automatic manipulators (industrial robots)". These were approved by the State Committees for Science and Technology, Planning and Prices.

In the matter of the questions raised by the author of the article concerning the planning and financing of consultative aid to enterprises doing pre-design and design work on industrial robots and incorporating them into production, this department holds that all these phases must be specified in sectorial, intersectorial and regional technoscientific and special-purpose programs developed in accordance with decree No.130/68 of March 30, 1984 issued jointly by the State Committee on Science and Technology, the State Planning Committee, the Academy of Sciences, the State Committee for Material and Technical Supply, the State Committee for Construction Affairs, the Ministry of Finance and the Central Statistical Administration.

The Machine Tool Building Department of Gosplan SSR considers it equally worthwhile to continue the exchange of views on questions relating to the organization and activities of regional and republic intersectorial robotics centers which are contributing to the development and widespread incorporation into production of industrial robots.

12258

CSO: 1823/10

## ROBOTICS

### NEW ROBOT MODELS REVIEWED

Moscow MOSKOVSKAYA PRAVDA in Russian 13 Jul 84 p 1

[Article by M. Cherkasskaya: "Attention: I am Switching-in a Robot"]

[Text] Fact

Moscow specialists developed an entire series of new industrial robots.

#### Commentary

Huge windows are screened tightly and in the darkness bright-yellow lamps are unblinking. This means that the instruction "grip part" is being executed correctly by the robot.

"In front of you is a pneumatic positioning robot of the second generation (MP-8)," explains leading engineer Ye. Belyayev. "It can sort parts and do some simple assembly operations. Lamps help us to monitor the accuracy of the execution of the program."

The outline of a small green rectangle appeared on the TV screen. Then mechanical "fingers" clamped it tightly and carried it carefully to box cells. We see that and the operator on the screen. There is no doubt -- the robot will not make a mistake and will place the part in a cell of the needed configuration since it has the so-called technical vision.

The MP-8 operates by compressed air. Moreover, it is positional. This means that it can stop at any place on instruction.

The robot's advantages are not limited by that. The robot is not afraid of chemically aggressive media and of the danger of self-combustion. And the main thing -- the entire complex is made with series produced technological equipment.

Novelties in this area can be seen at the USSR VDNKh at the machinebuilding pavilion where "Industrial robots and technological robotized complexes" are exhibited.

Of interest is a very original machine on wheels looking like a twin of the MP-8. Strictly speaking, it can be called a machine only very conditionally. It is simply a fairly long and deep cart. It moves on a strip and suddenly stops. A contact safety bumper operated. There was an obstacle on the strip -- a match box. We are looking at the MA-14T transport robot. It is used to move parts from the warehouse to the technological equipment and will be used in highly automated production facilities where machines will replace people.

Now, its movement is controlled by a microcomputer on the basis of data received from tracking sensors.

And here is a robot that reminds one of a vertical machine tool. It promises an impressive economic effect. It will be used by enterprises where painting is required. Its problem is to move the paint sprayer to the right place on time, monitor the printing quality and the expenditure of materials.

The novelties exhibited by many collectives of industrial enterprises and design bureaus at the main exhibition of the country shows graphically how the range of the robot trades have broadened.

2291

CSO: 1823/20

## ROBOTICS

### ROBOTS AT A MODERN LITHUANIAN PRODUCTION PLANT

Moscow IZVESTIYA in Russian 2 Jul 84 p 1

[Article by I. Kasyukov, IZVESTIYA correspondent: "Robots Help" (Vil'nyus)]

[Text] There is a competition for state bonuses for 1984 for working on automated highly productive and waste-free production facilities in manufacturing plastics by using robot equipment. This fact is commented on by A. K. Brazaukas, secretary of the Lithuanian Communist Party Central Committee:

"Everyone visiting the plant for the first time is pleasantly impressed by the industrial power of the production facility and the small number of service personnel. Here is the first building. An area of almost half a football field contains up to 100 machine assemblies for manufacturing single plastic articles and about 50 technological lines for making all kinds of pipe from polyethylene film. People to service the equipment can be counted on the fingers. Most operations, especially labor-intensive and tiring ones, are transferred to machines. A similar picture may be seen at other production sections of the enterprise."

"Now with regard to the robot equipment. Robots in the shops are nothing new in republic enterprises. At the Panevish 'Ekranace' they replaced manual operation at glass melting furnaces and kinescope assemblies where heavy parts must be moved. This freed 240 workers from labor-intensive operations, while labor conditions were made easier for 300 workers."

We will now return to the plastic product plant. Of all plastic processing forms, the automation of pressing is the most difficult. It is necessary to load the raw material, remove the articles, clean molds and execute a large number of other monotonous operations manually... During a shift several thousands of operations on one press alone are required. This slows the productivity of labor and narrows the service zone. With such conditions one worker cannot service more than two presses. Yet the plant has hundreds of them. Of course, the presses could be replaced by casting machines. But it was calculated that this would require huge expenditures. Inquisitive innovators proposed a more efficient way to solve the problem -- use robots."



"At present, several automated lines using robot equipment for pressure molding of thermosetting plastics are in operation. They were designed and manufactured by the plant experts. While before two workers could hardly cope with servicing four machine tools, now they can service 23! Here, the duties of the workers were reduced only to monitoring the automatic equipment."

"The technical solution of the automation at the plastic articles plant has no equal in industry abroad. The example of the collective of this plant promises huge savings to related industries in the country."

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## ROBOTICS

UDC 621.869.002

### DEVELOPMENT, NEW APPLICATIONS OF SOVIET ROBOTS

Kiev TEKHNLOGIYA I ORGANIZATSIYA PROIZVODSTVA in Russian No 3, Mar 84 pp 19-21

[Article by B. A. Tyutin, L. V. Voroshnina, L. V. Polosin, engineers:  
"Development and Introduction of Industrial Robots at the Modern Stage"]

[Text] At the end of the 10th Five-Year Plan period, the park of industrial robots (PR) was concentrated basically in machinebuilding. In the 11th Five-Year Plan period, it is planned to increase the volume of PR introduction in production facilities with difficult and unhealthy working conditions. Thus, the PR park for casting was increased 6-fold, painting -- 10-fold and for welding -- 20-fold.

In recent years, domestic robot building passed from experimental specimens of two-three PR models to the industrial output of over 60 models.

Robot equipment has great possibilities. The use of comprehensive PR makes it possible to increase the productivity of labor an average of 1.5 to 2-fold, the shift coefficient of equipment by 1.5 to 1.8-fold, as well as improve the regularity and standard of production considerably. Total time losses, due to servicing, repairing and adjusting robots, do not exceed 2 percent.

Pneumatic PR with a cyclic control program and a lifting power of 10kg are the most widely used in industry. This group includes such models as "Brig-10," PR-10I and "Tsiklon-3.01" which equal models abroad.

PR with hydraulic drives with a lifting power of 15 to 50kg and more are in the second place. They have positional or contour control. This group contains "Universal-15," "RS-25P, MAN-63S, etc.

A small but rapidly growing PR class are electromechanical ("Universal-5.02," RKTB and RPM-25).

About 90 percent of the PR have one arm, while more complicated PR have 2 or 4 arms. By using several arms, they can remove a finished product and set up the following intermediate product without stopping the operation of the machine tool.

PR are basically stationary. Movable robots are used to service automatic lines in electroplating shops, etc.

The comparative evaluation of domestic and foreign PR showed that the domestic ones do not take second place to those abroad in positioning accuracy and have similar distribution with respect to the type of their drive and control device systems. However, in reliability, speed of operation and size-weight parameters a considerable part of domestic PR is not as good as best world specimens.

Excessively complicated models are being developed which leads to their higher cost and larger size, although the functional possibilities of the robots are increased. The share of slow speed PR with speeds of 0.5 m/sec is considerable. The low revolution speed of many domestic manipulators is due to the use of non-specialized drives for general machinebuilding purposes. The share of PR with memory capacities of 50 to 100 instructions is somewhat greater in the USSR than abroad. There are not enough robots that operate in cylindrical and, especially, in the spherical coordinate systems.

The development and introduction of PR is an interindustrial problem which must be solved by an interindustrial program. The basic problem of the head organization in the country on industrial robot equipment is PR standardization and coordination of work on creating PR and robot technological complexes in the country.

The leading ministry is creating and producing PR control systems in the USSR Ministry of Instrument Making, Automation Equipment and Control Systems, while the USSR Ministry of the Machine Tool and Tool Industry is the leading ministry in creating and introducing PR in machinebuilding. The Experimental Scientific Research Metal Cutting Machine Tool Institute is the leading organization in creating PR for servicing metal-cutting machine tools; the Experimental Scientific Research Forge-Press Machinebuilding Institute -- for servicing forge-press machines; and the All-Union Foundry Machinebuilding, Casting Technology and Automation of Casting Production Institute -- for servicing foundry machines and electroplating lines.

The Electric Welding Institute imeni Ye. O. Paton of the UkSSR is the head organization in the USSR for creating PR for welding.

A broad program is being implemented in the UkSSR to create and introduce PR in production. A target program on the "Sborshchik" project was developed to create PR and a complex of technological equipment for mechanical assembly and installation and, on their basis, build robot technological assembly complexes (RTK). The head organization for this is the Kiev Polytechnical Institute. The program coordinates efforts of 13 vuz in the UkSSR, RSFSR and MSSR, 2 institutes of the UkSSR Academy of Sciences and 15 industrial sector organizations. The program was approved by the USSR State Committee on Science and Technology. It is planned to create 44 typical RTK for basic assembly processes. It is expected that the economic effect from introducing one assembly RTK will be 20,000 to 100,000 rubles per year.

The NIIPtmash (Kramatorsk) develops automatic lines with PR in machining production facilities. An experimental automatic section consisting of two NC lathes, a "Universal-15M" robot and storage devices was created. The section is used to machine shafts 50 to 120mm in diameter and 300 to 1000mm long.

The PTIMASH (Khar'kov) designed and introduced, at the Pervomayskiy Machine-building Plant, a section for machining parts using PR in a line for making diesel valves. Two "Brig-10" robots service a milling machine tool and two hydraulic-copying lathes. The economic effect of this introduction is 12,000 rubles per year.

The Electric Welding Institute imeni Ye. O. Paton of the UkSSR Academy of Sciences created PR for automatic arc and resistance spot welding. They are being introduced at enterprises in Kiev and other cities in the republic. These PR make it possible not only to automate welding processes but also to raise the quality of assembly.

The PTKTIsel'khoz mash (Khar'kov) developed a robotized section for machining shafts in series and mass production.

The Odessa Scientific Research Institute for Special Casting Methods developed a PR for removing castings from molds. The Kiev PO [Production Association] imeni S. P. Korolev introduces a PR to feed metal from the furnace to a pressure casting machine. The Kiev "Kommunist" PO uses an automatic line with a type "Tsiklon" PR for machining flat parts. This association operates a robotized complex using the RF-201M robot. An automatic flow line using the "Brig-10" PR was introduced at the Khar'kov Tractor Plant imeni S. Ordzhonikidze.

Robotization of production processes not only showed the high efficiency of these measures, but also made it possible to identify shortcomings: insufficient (or lacking) special services on introducing and servicing PR at enterprises; lack of starting-adjusting organizations to install and service PR and RTK; unpreparedness of enterprises to introduce PR.

To install PR, it is necessary to manufacture auxiliary equipment to orient and feed piece-by-piece parts which requires additional production services. Therefore, in most cases, it is necessary to replan and rearrange the equipment. At the first stages of PR introduction, it is advisable to concentrate attention on individual sections which eases the process of centralized servicing of the equipment.

The following must precede the decision to use PR and RTK:

analysis of the list of parts (and their intermediate products) that will be used in manufacturing employing PR;

selection of the PR-machine tool arrangement;

analysis of the technology for manufacturing parts using PR (review of technology and possibilities of machine tools and PR);

coordination of the movement trajectory of the arm of the PR with the sequence of manufacturing parts on the machine tool or group of machine tools (speed of motion, trajectory of arm movement, PR operating cycle);

selection and development of auxiliary equipment and accounting and business machines for the RTK (equipment formoving and orienting parts in the RTK zone and packing);

planning arrangement of equipment in the RTK (location of orienting devices, packing, accounting and business machinery with respect to the machine tool and group of machine tools);

preparation of charts for the organization and technology of parts production in the RTK zone;

calculation of the social-economic effect of introducing PR and RTK.

The proper organization of robot production and their introduction into the national economy can replace about a million workers in difficult operations and save about a billion rubles.

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## ROBOTICS

### BRIEFS

ROBOT TEST DRIVER -- Togliatti -- A new picture may be seen at the Volga Automobile Plant -- the driver behind the wheel of the automobile is a robot at one of the test sections of the proving ground in a climate chamber where labor conditions are harmful to health. The test indicated that it copes fairly well with its duties. At present, an industrial prototype is being manufactured, taking into account the results of the first tests. [By N. Chulikhin]  
[Text] [Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 9 Sep 84 p 2] 2291

ROBOT WELDER -- Moscow -- Robots are given responsible operations on the conveyor of the Moscow Automobile Plant imeni Lenin's Komsomol. The manipulators are entrusted with welding vehicle bodies. By the end of the year, the robot family was increased by several more machines which will undertake a number of labor-intensive processes. The introduction of this equipment is an important step in changing enterprises to flexible technological systems. [Text] [Baku VYSHKA in Russian 21 Aug 84 p 1] 2291

ROBOTIZED PRODUCTION CELLS -- Because of the introduction of automated equipment equipped with manipulators and the creation of robot technological complexes the output of watches at the Minsk Watch Plant increased 2.5-fold. Over 43 percent of them are manufactured with the emblem of quality today. In the assembly shops of the plant alone, 20 robot technological complexes with 216 manipulators were introduced in 1984. This saved 1,275,000 rubles and conditionally freed 65 people. A total of 1237 manipulator in 705 automatic, semiautomatic and technological robot complexes were used at the plant at the start of the fourth year of the 11th Five-Year Plan period. All this made it possible for the Minsk Watch Plant to save 1,177,000 rubles and free 617 people conditionally. [Text] [Minsk SOVETSKAYA BELORUSSIYA in Russian 20 Jul 84 p 2] 2291

HEAVY-LIFT ROBOTS -- Mogilev (TASS) -- The Mogilev Experimental Automation and Mechanization Equipment Plant began production of pneumatic manipulators for labor-intensive work at machinebuilding enterprises. These devices are capable of moving parts weighing 125 kilograms for distances up to three meters. They can service metalworking machine tools and do well in a mechanized flow-line. On the plant's program now is the mastering of manipulators with a load-lifting capacity of 250 to 500 kilograms. [Text] [Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 10 Jul 84 p 2] 2291

ROBOTIZED ARC WELDING LINE -- Tula, 21 (Jul) -- The Tula Machinebuilding Plant imeni V. M. Ryabikov placed in operation an original, efficient technological robot complex. It was designed to manufacture hubs, the central part of the motor scooter wheel. The complex consists of three semiautomatic arc welding machines in a carbon dioxide medium; an installation for straightening parts, seven robots and several leading devices. The majority of the installed machines and devices were made in the plant's shops. All labor-intensive processes are executed automatically on this technological line. [By N. Makharinets, supernumerary correspondent of PRAVDA] [Text] [Moscow PRAVDA in Russian 22 Jun 84 p 3] 2291

ROBOTS USED IN ASSEMBLY -- Vladimir -- The Vladimir Electrical Motor Plant placed a new robotized complex in operation for machining and assembling parts. Parts are machined automatically on milling and grinding machine tools. The thermal assembly of the rotor and shaft, a very labor-intensive operation, was previously done manually. First it was necessary to preheat the rotor in a furnace, then the heavy parts were moved to the assembly point by a crane. Now these operations are done by a manipulator that services a broaching lathe. Only three operator-adjusters control the robotized complex. The complex for the Vladimir people was developed at Khar'khov, while the special broaching lathe was sent here from Minsk. The saving is over 35,000 rubles per year. [By A. Yershov] [Text] [Moscow IZVESTIYA in Russian 22 Aug 84 p 1] 2291

CSO: 1823/16

DNC, CNC NETWORK FOR ROBOTIZED MACHINING CELLS

Moscow MEKHAIZATSIYA I AVTOMATIZATSIYA PROIZVODSTVA in Russian No 5, May 84  
pp 5-6

[Article by N. I. Dmitriyev, candidate of technical sciences and A. A. Yurchenkov, P. P. Zuyev, engineers: "Automation of Machining on NC Machine Tools"]

[Text] One direction in increasing further the productivity of labor of machining in small series production is the automation of the technological processes by introducing technological robot complexes with NC machine tools. The increase in the NC machine tool park at the Minpribor [Ministry of Instrument Making, Automation Equipment and Control Systems] enterprises, on the one hand, and the constantly increasing flow of past operations, on the other hand, led to the necessity of direct control of machine tools by CNC.

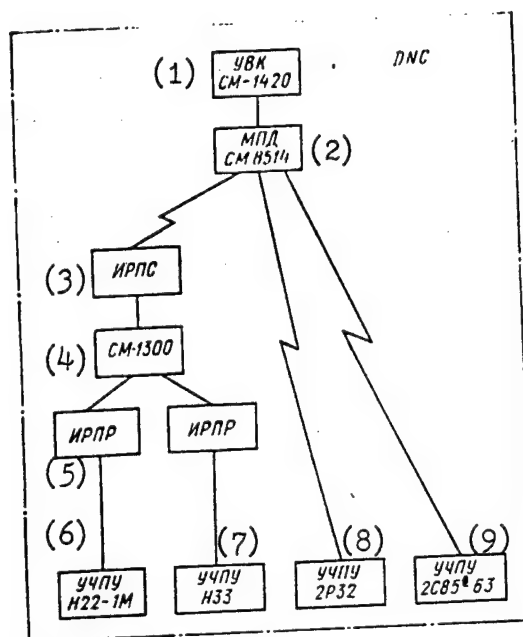
At present, Minpribor plants are equipped with NC systems that have a rigid structure with defined control functions, and with CNC systems that have a flexible, readjustable structure in which it is possible to reprogram the operating algorithms. In order to control NC systems by instructions received directly from the computer, it is necessary to have a type DNC control system (see Figure).

The organization of communications between CNC (type N22-1M, N33, etc.) and high rank computers is possible after modernizing the given NC devices. SM-1300 minicomputers are used. A communications unit between the upper rank computer and NC devices is shown in the Figure. Communications are organized through data transmission multiplexer SM-8514 which has an output to 16 IRPS channels.

The investigation of a number of Minpribor plants showed that distances between the control computer and sections of NC machine tools are about 300 meters which is less than the radius of MPD SM-8514 without using additional equipment.

It should be noted that at present, there is no single process for distributing control programs from the UP [Control program] library. Therefore, control system developers must develop independently the algorithm for transmitting control programs to NC devices.





Figure

1 -- UVK Control computer complex SM-1420; 2 -- MPD Data transmission multiplexor SM8514; 3 -- IRPS [expansion unknown]; 4 -- SM-1300; 5 -- IRPR [expansion unknown]; 6 -- UCHPU CNC N-22M; 7 -- CNC N33; 8 -- CNC 2R32; 9 -- CNC 250563.

At present, an "PARMA" automated shop with CNC machine tools is being created at the Ufa "Geofizpribor" Scientific Production Association.

Each NC machine tool is equipped with a receiving delivery platform and a PUR-10 loading-unloading robot. An overhead RTSh8-50 transportation robot is used for intrashop transportation of intermediate products, parts, tools and fixtures. A robotized shelving-packing warehouse complex (TRSK) is used for warehousing operations.

An SM-1400 computer is used for control. It has an external magnetic disk memory for creating control program libraries, NC SAP [expansion unknown], for solving problems of the planning, accounting, dispatching and controlling basic and auxiliary equipment.

All user programs operate in the OS [Feedback] RV [expansion unknown] medium and use a multiprogram operation of SyeTOR SM operating mode keeping a system log, which must be taken into account when solving subscriber problems.

Directions are used to make entries or remove them from the system. Directives can be inserted singly or in groups.

The section receives the monthly plan from the ASUP [Automatic System for Enterprise Control] in the form of a list of the sequence of planned tasks. As a result of solving the problem, "Insertion of norm-reference data on a part, machined in the section," a file is formed which includes the enumerated parts and operations for a monthly program for machining on NC machine tools and the number of the control program. The control program for NC systems types N33-1M, N22-1M is prepared by the SAP-NC and NC devices NTs31, 2R32 and 2585-63 that enter and edit the programs from the operator control panel. The control program heading specifies the number of the program, the part designation, the operation number, the machine tool number and the NC system. A control program library was created to eliminate manual operations in storing, searching and correcting. The control program library stores all programs written in NC language and in the initial NC ASP language. The system stores, searches, changes, and monitors the control programs and edits them in the dialogue mode; the output of the available programs is on punched tape or a video terminal, as well as going directly to the memory of the NC system.

Control program monitoring includes identifying errors in the structure, size and format of the frame when letter symbols are coded.

Control program correction is implemented within the framework of the EDI and SLP text editor systems.

The control programs can be copied within the possibilities of the PIP and FLX program systems which make it possible to rewrite programs from practically any device in the system.

After the control programs are transmitted to the NC memory by instruction from the SM-1420 computer or from the control panel at the work position (in the manual version), the transport robot delivers the proper packing with intermediate products and tools from the type TRSK automated warehouse and places them on the receiving-delivery platforms near the NC machine tools.

Here the loading-unloading robot removes the intermediate product from the packing and places it in the fixture with an automatic positioning system. After the intermediate product is machined according to a given program, the robot places the finished part in a cell of the packing and then takes the following intermediate product and places it in the fixture. The automated cycle is repeated until all parts in the packing are machined.

The transport robot delivers packing with machined parts to the warehouse. After machining the lot of parts, packing with the tools is delivered to the warehouse for storage.

The considered computer controlled machining system opens up wide possibilities for the comprehensive automation of production and will make it possible to minimize the number of people servicing and operating such a system during three shifts.

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ADVANTAGES OF IMPLEMENTING NC MACHINE TOOLS DISCUSSED

Moscow MASHINOSTROITEL' in Russian No 7, Jul 84 pp 12-13

[Article by Yu.P. Kukuyev and Ye. V. Trukhan, engineers: "Some Problems Associated with Raising the Effectiveness of Using NC Machine Tools"]

[Text] Numerical control machine tools are now one of the principal resources associated with reequipment, mechanization and automation of small-series and series production in machine building.

Almost all machine tool building plants of machine tool building enterprises in the Belorussian SSR have mastered production of NC machine tools, and they are continually increasing their production. The proportion of NC machine tools within the whole machine tool fleet servicing the principal production operations averages 9.2 percent in the republic. According to 1983 data the largest proportion of NC machine tools is possessed by the Minsk Association for Production of Broaching and Cutting-Off Machines imeni S. M. Kirov--21 percent.

The continually increasing volume of NC machine tools being produced and introduced is imparting urgency and economic significance to the problems associated with insuring the fastest possible introduction of these machine tools into operation and organization of their effective use. A significant quantity of organizational and technical measures have been directed at solving these problems. Thus in order to insure the fastest possible introduction of NC machine tools into operation and their technical maintenance, the Ministry of Machine Tools and Tool Building Industry has organized the All-Union Soyuzstankoremnaladka Industrial Association containing a number of setting-up organizations. Setting-up services are also provided by the plants manufacturing the NC machine tools; the appropriate subdivisions (services) have been created for this purpose.

However, development of specialized setting-up organizations and the corresponding subdivisions at NC machine tool manufacturing plants has not yet enjoyed adequate development, and it is unable to fully insure timely

commissioning of NC equipment. This situation compels the most qualified users to perform setting-up operations of moderate complexity through their own resources, despite the fact that equipment installed in this fashion loses its entitlement to warranty service. For enterprises with little experience in operating NC machine tools, unsatisfactory organization of setting-up operations continues to be a serious problem. Moreover specialized setting-up organizations and manufacturing plants provide practically no ongoing service.

Multiple-machine maintenance is being introduced into practically all enterprises using NC machine tools. This is one of the significant criteria of the economic effectiveness of using such equipment. However, manufacturing plants do not always devote adequate attention to insuring sensible multiple-machine service. The unchangeable arrangement of electric panels and numerical control systems makes it impossible to create an optimum work zone for the machine tool operator, with regard for the convenience of delivering and positioning blanks and worked parts at the work stations, to minimizing the machine tool operator's movements and to removing chips from machine tools and from the section as a whole. Moreover sensible use of production space with regard to different combinations of equipment and the conditions of its placement is not insured, and possibilities for widening a machine tool operator's zone of service are inhibited. Thus were we able to make it possible to vary the location of electric panels (not only on the left but also on the right of the machine tool) on a certain experimental vertical lathe, we would be able to automate delivery of blanks to the work stations and dispatch of machined articles, remove chips from the machine tools and save about 4.0 m<sup>2</sup> of area per work station. It would be even more effective to combine two single-spindle tools into one two-spindle tool. Creation of such tools was foreseen by the "Standards on Numerical Control Metal-Cutting Machine Tools for 1976-1980" (developed by the Experimental Scientific Research Institute of Metal-Cutting Machine Tools), but production of such machine tools has not yet been organized.

Advantages in organizing adjustment of machine tools make multiple-machine service of NC machine tools effective. Machine tool operators adjust NC machine tools at many enterprises, including those involved in small-series production. The apparent reduction in the number of workers within a section leads to idleness of machine tools awaiting adjustment and to idleness of adjusted tools because the operator is busy with adjusting other tools. Idleness resulting from this cause increases with growth in the number of adjustments to be made (especially in small-series production).

The experience of the leading enterprises demonstrates the effectiveness of organizing centralized adjustment by adjusters and surrender, to the operator, of a ready machine tool together with all of the necessary documents, gear and monitoring and measuring instruments. The adjusters carry out all preparatory jobs and adjust the necessary attachments away from the machine tool while the operator is still working on a previous lot of articles and while he is servicing his own machine tool. While an adjuster is adjusting one machine tool, the operator uses a second machine tool to machine the parts. Presence of full-time adjusters in NC machine tool sections reduces machine tool

idleness when an operator does not show up for work due to sickness or other causes, since the adjuster could replace the operator in this case.

A qualified adjuster can precisely adjust attachments before placing them on the machine tool, reduce the tool adjusting time, raise the quality of adjusting and consequently increase the quality of part machining and insure better use of the technological possibilities of NC machine tools. Calculations show that given an average number of adjustments during a shift--1.5, additional production resulting from centralized adjustment would be 30 percent.

One of the important factors in the economic aspect is full utilization of the technological possibilities of NC machine tools. At most enterprises the operations used with NC machine tools replace similar operations used with manual control tools. The only exceptions are multipurpose machine tools, such as the machining center. But in terms of technical characteristics, NC machine tools have significantly greater technological possibilities, since their precision class is higher, and they can machine parts on the basis of a program with closer tolerances than can manual control tools.

Thus according to requirements of the manual RTM 2N-70-1-78, "Machine Tools, Metal-Cutting. Supplementary Tests on NC Machine Tools. Precision Norms," and the machine tool acceptance document, the precision norms of NC lathes must provide for the machining of diameters with a precision corresponding to quality class 7. This makes it possible to do finish work on a number of parts with class 7-8 tolerances on inner and outer diameters, and to satisfy stiff requirements on the closeness of neighboring part surfaces. Thus it becomes possible to shift circular, internal and face grinding operations from manual control tools to lathe work on NC machine tools, to arrive at a significant decrease in laboriousness and to reduce the machining cycle. But this advantage of NC lathes is hardly being utilized, because by the time the warranty period expires, such tools cannot usually maintain this precision. There are no recommendations or experience in restoring the initial precision, and therefore plant repair services are able to maintain only the operability of machine tools, and not their precision.

Development of recommendations and methods of restoring the initial precision of machine tools so that plant repair services could maintain not only the operability but also the precision of these tools, and so that they could be serviced by specialized organizations and by NC machine tool manufacturing plants, would insure complete utilization of the technological possibilities of the equipment, and consequently raise the effectiveness of its use.

This problem is becoming especially urgent now because directives foresee creation of robot-equipped complexes permitting independent operation for one or two shifts and automatic control of the dimensions of machined parts.

Growth in the fleet of NC equipment and a tendency for growth in its production also require improvements in organization of its prompt and high-quality maintenance. Complete utilization of technical possibilities and dependable operation throughout the entire life of the equipment must be insured for NC

machine tools. With this end in mind, in our opinion it would be suitable to include full-time adjusters in brigades servicing sections containing over six NC machine tools. Their pay should be tied in with the quantity and quality of products manufactured by the equipment they service. Setting-up operations and ongoing maintenance must be conducted by the manufacturing plants, which will insure timely analysis of the dependability of the work of the machine tools and individual units. This would also make it possible to reveal data on the basis of which to make further design improvements and expand the technological possibilities of NC machine tools, and it will raise the responsibility of manufacturing enterprises for the quality, reliability and technical level of the equipment they produce.

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